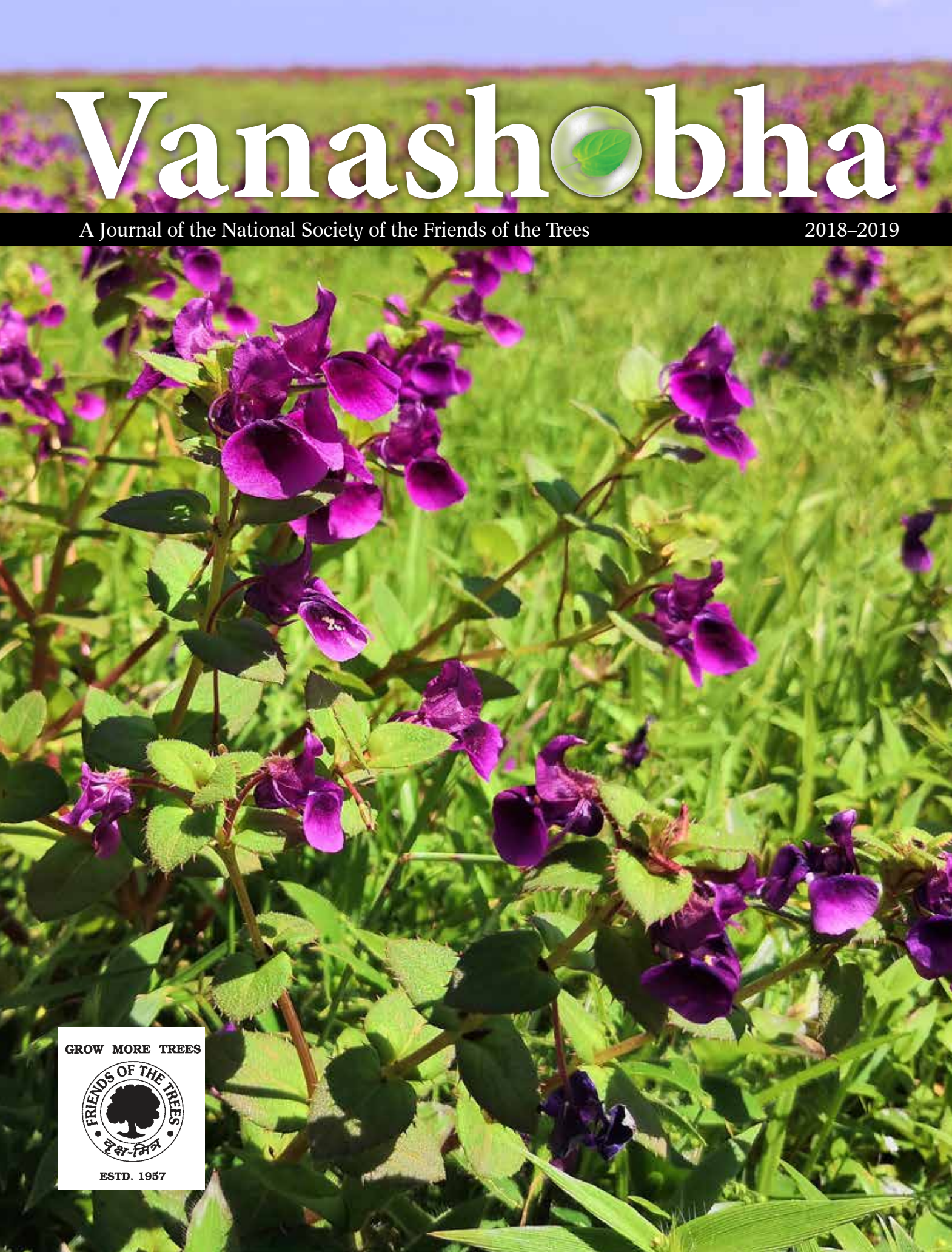
Vanashobha

A Journal of the National Society of the Friends of the Trees 2018–2019



GROW MORE TREES

FRIENDS OF THE TREES

वृक्ष-मित्र

ESTD. 1957

Vanashobha

A Journal of the National Society of the Friends of the Trees

FRIENDS OF THE TREES FOUNDED IN 1957
A fellowship of tree lovers seeking to create and foster a tree sense in India

Registered under the Societies Registration Act, 1860, and the Bombay Public Trust Act, 1950.

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Union Co-operative Insurance Building,
3rd Floor, 28, Sir P.M. Road,
Fort, Mumbai – 400 001.
Phone: +91 22 22870860/22024843
Email: friendsoftrees16@gmail.com
Website: www.friendsoftreesindia.com

Editor: Dr Pheroza J. Godrej

Editorial Consultant: Dr Gayatri Ugra

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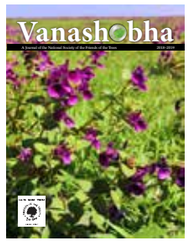

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From the Desk of the President Emeritus

In the year 2019, not only Mumbai but almost the entire country experienced a delayed, erratic, and exceptionally prolonged season of rainfall. India's monsoon extended by almost two months, with record rainfall and several days of deluges, leading to unprecedented suffering. The country has borne huge financial losses by way of crop destruction, livestock and livelihood loss, together with a slow-down of commercial activities. Normally, the monsoon in India recedes by the beginning of September. However, this year the situation continued further into October, finally receding in mid-November. The monsoon was also late to arrive. Many areas suffered acute water shortage and farmers braced themselves for a possible drought. The extended monsoon is also not good for farming activities, as it leads to crop loss and a wet drought situation, with price rise of vegetables and other essential food ingredients.

Now we know for sure, "Climate Change" is real and here already. Climate is impacted by the different elements of nature which are complexly intertwined and interconnected. Conversely, climate change affects these very elements, be it weather, temperature, water, soil, or the larger environment. For example, if we were to estimate the impact of climate change on rivers and the morphology of river basins, we must first estimate its impacts on the precipitation and evaporation, the natural ecosystems, the runoff, and lastly on the morphology of river basins. It is also important to analyze the pivotal role of trees and vegetation in the entire chain of dependency. The "FOT National Seminar on Climate, Rivers & Vegetation" discussed precisely these aspects, and with an enlightening Keynote Address by the Chief Guest Mr Bittu Sahgal, participants could gain good insights into the complexities of climate change.

We also discuss in this issue, through interesting and thought-provoking articles, various topics right from ascertaining whether the Earth is really getting warmer, to a discussion on Global Warming and Climate Change, Impact on Water Resources, and an insight into the Use of Carbon Negative Materials.

Each World Environment Day is celebrated around a theme that focuses attention on a particularly pressing environmental concern. The theme for 2019, "Beat Air Pollution," is a call to action to combat this global crisis, inviting all to consider how we can change our everyday lives to reduce air pollution and its effects on our own health and thwart its impact on global warming. In the words of UN Secretary-General António Guterres:

> *"It is time to act decisively. My message to governments is clear: tax pollution; end fossil fuel subsidies; and stop building new coal plants. We need a green economy, not a grey economy."*

Global warming and climate change are universal concerns, and together we need to ensure meaningful action. Extreme weather events bring with them a multitude of immediate and long-term challenges that need to be acknowledged and then attempted to be addressed in the most effective way. Every event is a learning experience. We need information sharing and analysis, using evolved tools to derive the right solutions. I am sure, however, that every solution to combat climate change will begin and end with planting more and more trees, and protecting and conserving our green cover. As we discuss this subject, I am grateful to Ms Tejashree Joshi, Head – Environment & Sustainability, Godrej & Boyce Mfg Co. Ltd, for her valuable inputs. One does not really need an expert or a scientist to tell us this fact. Trees, after all, are our greatest climate regulators, a micro ecosystem in themselves and a blessing to all life forms and elements on this planet.

For the 58th year, we continue to celebrate the bounties of nature and trees. Our "Annual Vegetable, Fruit & Flower Show", which was held on February 9–10, 2019, was blessed with inspiring addresses by our Chief Guests, Ms Nidhi Chaudhari, Deputy Municipal Commissioner (Special), Municipal Corporation of Greater Mumbai on 9th February, and Padma Vibhushan Dr Anil Kakodkar, Former Chairman, Atomic Energy Commission, Govt of India on 10th February. It is heartening to see the continued enthusiasm of participants and visitors from Mumbai, as well as those coming from other parts of India, keeping a ray of hope alive for a brighter and greener future.

Dr Pheroza J. Godrej
President Emeritus
National Society of the Friends of the Trees

GROW MORE TREES

ESTD. 1957

NATIONAL SOCIETY OF THE FRIENDS OF THE TREES

A fellowship of tree-lovers seeking to create and foster a tree sense in India

Objectives

1. To inculcate love of trees and plant life in general among the people.
2. To create an enlightened public opinion for promoting the setting up and maintenance of more avenues on our highways and for building more parks and gardens in our cities and for growing of suitable trees in all public places to enhance the beauty of our landscape both rural and urban; and for preserving and extending our forests now in grave danger due to various causes.
3. To organize public lectures, talks to select groups including schools and colleges, film shows, exhibitions on trees and allied subjects.
4. To hold competitions, flower, vegetable, and fruit shows, national or state conventions and seminars for the furtherance of the objects of the Society.
5. To plant and protect trees.
6. To organize publication of suitable literature including periodicals and maintaining library or libraries for the encouragement of such studies.
7. To undertake special studies of the needs of, and suggesting tree planting schemes for large private institutions, local bodies, community projects, national extension services, etc.
8. To establish contacts with other organizations having similar objects.
9. To secure government and public support for activities on the lines mentioned above.
10. Generally to undertake activities deemed necessary and desirable for the promotion of the objects aforesaid.
11. To establish branches of the organization in different cities, towns and villages where enough organizational element is available and local membership potentialities exist.

Past Presidents of the National Society of the Friends of the Trees

From its inception to this day, the honorable members who have held the post of President of the National Society of the Friends of the Trees have given generously of their time and resources, to support and enhance the standing of the Society. FOT honours them and records here its appreciation of their valuable contributions. Given below are the dates of their tenures.

Mr B.G. Gade 1957–1962

Mr V.P. Naik
1962–1971

Mr J.J. Bhabha
1971–1998

Mr S.P. Godrej
1998–2000

Dr Pheroza J. Godrej
2000–2016

FRIENDS OF THE TREES 58TH ANNUAL VEGETABLE, FRUIT AND FLOWER SHOW, FEBRUARY 9, 2019 AT D.G. RUPAREL COLLEGE, MUMBAI

Address by the Chief Guest, Ms Nidhi Chaudhari, Deputy Municipal Commissioner (Special), Municipal Corporation of Greater Mumbai

Mumbaikars are 'Friends of the Trees' for Centuries

Ms Nidhi Chaudhari, Deputy Commissioner, BMC was kind enough to consent to be the Chief Guest at the 58th Annual Vegetable, Fruit and Flower Show held at Ruparel College, Mumbai. Ms Chaudhari expressed her joy at being back at Ruparel College, her Alma Mater. She was struck by the diversity of plant species as she went around the Show with Dr C.S. Salunkhe. The myriad colours, countless varieties of flowers, fruits, and trees offered her a glimpse of nature's immense beauty and diversity.

Mumbaikars, according to Ms Chaudhari, have been 'Friends of the Trees' for centuries. Raja Bhimdev, the 12th century Solanki king, established several habitations in Mumbai in the name of native trees: Wadala after *vad*, that is Banyan *Ficus benghalensis*, Bhendi Bazar from the Bhendi tree *Thespesia populnea*, Chinchpokali associated with Tamarind *Tamarindus indica*, Babulnath from Babul *Acacia nilotica*, and Phanaswadi after the Jackfruit *Artocarpus chaplasha*. Yet it is ironical, according to her, that today there is not a single Babul tree in Babulnath.

Just like the vegetation around us, all of us humans are different and unique. It is this uniqueness that should be recognized and celebrated. She welcomed the fact that Friends of the Trees had invited a woman for the first time in its 58 year history to be the Chief Guest, and expressed the hope that FOT would extend this privilege to other significant individuals — the differently abled, transgenders, and those otherwise challenged. For in diversity lies the uniqueness of humanity!

Referring to Dr Pheroza Godrej's discussion on Climate Change, Ms Chaudhari said that never had Mumbai been as cold as it is today. Today's temperature change may be small, but it is definitely one of the indicators of climate change. The conservation of greenery is essential for reversing climate change. Everything cannot be left to the government and active participation by citizens is a must for Mumbai to remain green. She urged Mumbaikars to be *vruksha mitra* — a guardian of trees. To be guardians, one must be selfless, she said, and she quoted an apt Sanskrit shloka from the Mahabharata to illustrate the selfless characteristics of Nature.

Paropakaraya phalanti vruksha (Trees provide fruits for others to eat)
Paropakaraya vahanti nadya (Rivers flow with water for others to use)
Paropakaraya dahanti gava (Cows give milk for others to drink)
Paropakarayamidam shareeram (Our physical body is for performing selfless service to others)

Ms Chaudhari concluded her talk with words of caution and wisdom. She said many scientific studies indicate that every species faces extinction. The time for the extinction of human species is drawing near. Hence, it is the duty of every earthling to preserve this biodiversity rich planet and keep it both green and beautiful for the benefit of species and generations that are to come after us.

Summarized and transcribed by Vijaya Chakravarty

Roses added colour to the floral displays.

FRIENDS OF THE TREES 58TH ANNUAL VEGETABLE, FRUIT AND FLOWER SHOW, FEBRUARY 10, 2019 AT D.G. RUPAREL COLLEGE, MUMBAI

Address by the Chief Guest, Padma Vibhushan Dr Anil Kakodkar, former Chairman, Atomic Energy Commission, Government of India

Good evening, friends.

Dr Ashok Kothari, President, National Society of the Friends of the Trees, Dr Pheroza Godrej, President Emeritus, Dr Tushar Desai, Principal of Ruparel College, my college, Vice Presidents Dr Saraswathy Unnithan and Dr Arun Sawant, all other office bearers, functionaries of the Society, colleagues who have been engaged in cultivating nature, enjoying nature, protecting nature, conserving nature, ladies and gentlemen.

First of all, I have to thank both Dr Sawant and Dr Godrej for this very gracious invitation. The event in itself was extremely important for me, but more than that I must admit that as it was being held at Ruparel College, I immediately said yes, and perhaps some of you may know that I have been a part of this college, but I did promise Dr Godrej that I would tell the story about how I became a part of Ruparel College, because this is something that saved one year of my life.

Actually it so happened that I did my schooling in Madhya Pradesh and the results of the SSC exams in Maharashtra are usually, and also in that year, declared well in advance of the results of the matriculation in Madhya Pradesh, so from the day the results are declared, within the few days the admissions are closed. So here I was, wanting to get into a college for higher education in Mumbai, not having any result or certificate, or any evidence that I had done matriculation, and I was seeing college admissions getting closed at a very rapid pace, and that it was a certainty that I would lose one full year. So, through a contact I met the then Vice Principal Prof. Bhide and told my story, and believe me, he granted me admission, provisional admission of course, without any certificate, without a mark sheet, simply on the promise that I would get a first class. And the contract was that if I don't get a first class, he would throw me out of college, and I had no difficulty in accepting the condition! So here I am, and I am very happy, and in fact I must say I narrate this story every time I come to Ruparel College. At one of the functions, the Honourable Governor Mr P.C. Alexander was also there, and I narrated this story in front of him. So the Governor said that the college has done a great job, but I would suggest that this should not be repeated. That is the story of my being a part of Ruparel College.

Coming back to today's function, I have been hearing about this function through newspapers and then later because BARC has been a regular participant in this event, so I have been hearing about this function through that channel, and it is clearly a major event in the calendar of Mumbai, from a cultural perspective, from nature's perspective, from the perspective of people who have an eye for the good things in life, for aesthetics, and above all, we are all concerned now with the equilibrium, the stability of nature itself, or for that matter about issues which have gone global, the existence of earth itself. So I must, along with all of you, acknowledge the great work which has been done, which is being done, and I am sure with the dedication of the people behind it, will continue to be done.

The exhibition is of course clearly great. There are many new things one can see here. I had never known, for example, that the long bean *dharambi* has medicinal values. Yes, *dharambi*, I can remember the Marathi name better than the English name. I think nature has tremendous treasures hidden within itself, and being aware of this is a great thing. In life, being able to do something valuable, taking several steps forward, should be the ambition of every active individual.

Professor Sawant mentioned the Rajiv Gandhi Science and Technology Commission. I had no intention of talking about it, but since you mentioned it, it just occurred to me that one could think of several synergies. The Commission is essentially looking at applications of science and technology for the development of Maharashtra. Of course we have a major focus on the rural scene, the agriculture scene. For example, we had this project which is still running, a group of which looks into the medicinal value of plants for veterinary practice; and a great deal of traditional knowledge exists among the practitioners of the so called ethno-veterinary practice. We were close to compiling a database, and it looks to me that these people have some very simple stories to tell, almost like the way a grandmother would treat a baby grandchild with some simple home remedies, medicines from the *aajibaicha batua*, as we call it. There are other people who are working on a gene bank project, the Maharashtra Gene Bank Programme, which is involved in biodiversity conservation, both in situ and ex situ, of all the important species in Maharashtra. It is a big project, running across some 17 to 18 centres, with an equal number of participating institutions. That project is being coordinated from ICAR, Pune and I am looking forward to that. There are some very interesting observations coming out of that programme.

Another programme which has recently been completed is a Medicinal Plant Database compiled by Agharkar Institute in Pune, and that database is now available on the website of the Rajiv Gandhi Commission, Agharkar Institute, the Department of Forests of the Government of Maharashtra, the Biodiversity Board, and so on. You can access this database, and if you want some additional information which has not been disclosed in the database, you can correspond with them and for research purposes that information will also be made available.

In the context of this Show, it seems to me that from the point of view of students, or from the point of view of researchers, apart from seeing the exhibits in which there is great joy, whether it is a flower, or a fruit or vegetable, or for that matter the bonsais, the flower rangolis of different patterns, I think it tells you a lot more than the practice of creating such things. Over and above that joy, there is for every product a wild variety. When one talks about the conservation of the gene pool, it is important that we look at these varieties along with their several wild counterparts, and their co-existence, to save the species from extinction.

So I think that is something which the students and I have now come to the conclusion that particularly through the medium of NSA, the National Social Service, which is a great programme, a lot can be done to mobilize efforts to collect a biodiversity database, compile traditional knowledge, link it with contemporary knowledge, and maximize not only the use of such a rich biodiversity but also enhance its conservation and preservation.

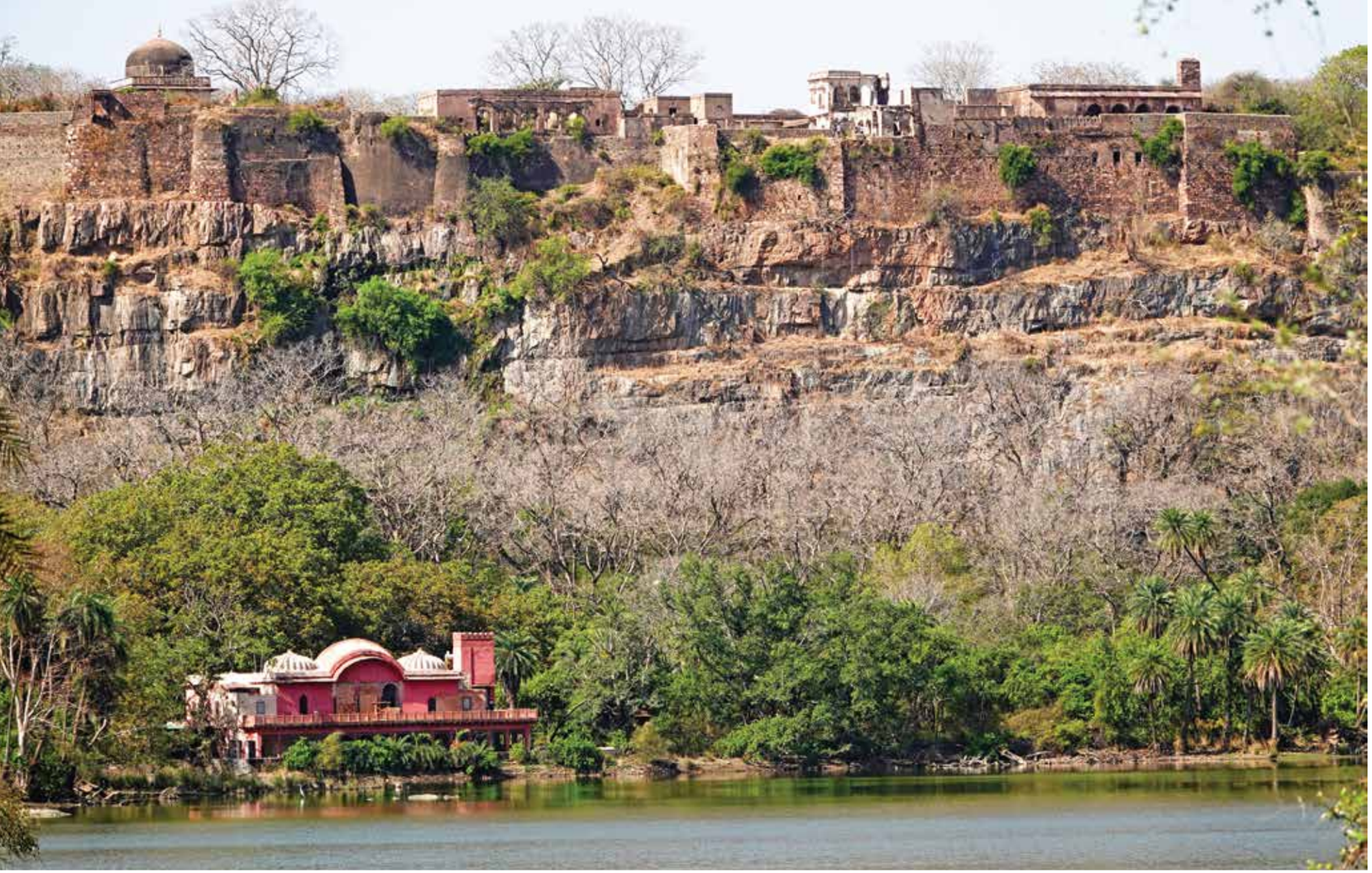
Once again, I would like to express my gratitude to everybody who is engaged in the Show, who is devoting time for this wonderful effort, and I congratulate all of you for the results that have been achieved. Finally, I present my special compliments and congratulations to all those who are winners of different awards and trophies in this Show.

Thank you very much.





A brilliant mosaic of flowers at the show.

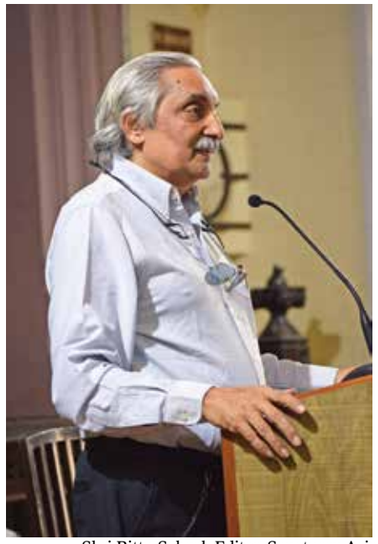


Jogi Mahal, Ranthambhore Wildlife Sanctuary, Rajasthan.

National Seminar on Climate, Rivers & Vegetation

Walking the Green Talk

Keynote Address by Shri Bittu Sahgal



Shri Bittu Sahgal, Editor, Sanctuary Asia

Nothing in the world pleases me more, or seeds me with more hope than interacting with young people, because, apart from their lack of cynicism, I know in my bones that ever since life began on earth, the only working strategy that has enabled our biosphere to survive the trials of life has been the handing over of 'survival batons' to the next, then the next, and then the next generation.

That is what I am doing today. That is what I have done for the past 40 years, and in the process, before my very eyes, the environmental movement has evolved from a peripheral human activity to one that is central to our survival. Not surprisingly, across the globe students like you are at the forefront. You are reminding adults that it is your world that they are inexpertly toying with. And that you have the legitimacy to be sitting at the table when the future of billions is being decided by elders who will not be around to face the consequences of damaging or destroying the only biosphere we know of that supports life in our galaxy.

So, as you attend class each day, as you analyze your future in terms of what jobs or occupations you might end up making your own, remember this: you have the legitimacy, the right, to demand from your elders that they stop damaging your world.

LET ME TAKE YOU BACK IN TIME

A few years ago, sitting under the famous Jogi Mahal banyan tree in the shadow of one of the greatest battlements of all times, the Ranthambhore Fort, my mind went back three decades to the time that Kailash Sankhala, first Director of Project Tiger, was speaking about his abiding passion – saving tigers. "If we cannot convince our country to protect forests in which tigers live, then something is wrong with our own communication skills," he said darkly. His views were echoed through the years by the likes of the legendary Dr Sálim Ali, author and ornithologist K.S. Dharmakumarsinhji, S.P. Shahi, ex Chief Wildlife Warden of Bihar, S. Deb Roy, ex Field Director of Manas Tiger Reserve, and so many others. Under the same banyan tree, I also once sat watching langurs with the famous photographer naturalist M. Krishnan, and I recall him saying: "The ancestors of these langurs were here when Ranthambhore Fort was in King Hamir's control. Who knows how much longer such protected forests will survive!" There was no despondency in Krishnan's voice, only commentary. But I knew how much pain people like him suffered when, before their very eyes, short-sighted and ignorant but powerful people were obliterating the magnificent tapestry of wild India.

None of the abovementioned people, whose lives had been dedicated to saving the tiger and its forests, are alive today. Before they died, however, they managed to share their mission with a host of younger warriors who continue fighting for the wildlife of India. And for all the bad news we hear today, we must have done something right, because, despite the fears, despite the predictions, *Panthera tigris* for instance still lives free in wild India.

The tiger is an amazingly charismatic symbol and the whole world is willing to rally behind it to protect wild places. But, as we seem to be discovering on a daily basis, the mere projection of its beauty or its threatened existence cannot prevent its steady decline. Apart from emotion, there are many rational reasons to protect the tiger and other wildlife, but these have not yet been effectively imprinted on society at large by the conservation movement.

YOU CAN MAKE A DIFFERENCE

Young people like you are the most powerful agents of positive,

Tiger roams the forest in Tadoba, Maharashtra.

environmental change. Young people not only have the legitimacy, but the fire to actually take the small and large actions vital to the task of reversing the ecological rot that adults of my generation have in mind for the planet. But fortunately, all the damage inflicted by us can be repaired, provided you young people do not make the mistake of taking our magical biosphere for granted, and that you learn to respect wild nature the way my grandmother and your great grandmothers did.

There is something truly hypnotic about wild nature, which exists right here in this room where geckos, spiders, and flies are playing out the deadly "eat or be eaten" game that urban citizens tend to associate only with jungles, where tigers, lions, and leopards roam. I can see the light in the eyes of you young women and men. It is the light of curiosity and adventure, and if you allow that light to keep shining, if you keep your mind open to the incredible learnings in store for you in and out of classrooms, in time you will all outshine any Member of Parliament you elect, when it comes to debating the connection between deforestation and the climate crisis that my misguided generation has bequeathed to you in the name of "development."

Put simply, we adults have let you children down thus far. But, among us are enough caring elders who know that it is still not too late to redeem ourselves; and that well-protected, politically-supported and sensibly managed ecosystems in the biosphere are capable of springing back to life within a relatively short span of time, probably no more than three or four decades – at which point it is you young people who will be speaking to wide-eyed youngsters to narrate the saga of how a lost generation in India and across the world almost lost the plot, because they imagined they had become more powerful than the systems of the biosphere, honed by billions of years of evolution.

If there is one learning I would like you to take from all the education that has been lavished on you since you were in kindergarten, it would be that Nature's systems are near-failsafe and nature 'knows' how to repair and manage itself. It will perform this miracle within your lifetime – provided you have within you the humility to accept that true development, happiness, and life-purpose are best met by flowing with and not against nature's tide.

GIVE EARTH A CHANCE

World Environment Day is celebrated on June 5. And around the world you children (bless you all) are forcing upon their elders the imperative of living more environment-friendly lives by recycling waste, campaigning to save wildlife, uniting to clean up streets, to be kind to animals, to learn about nature and, generally, to prove that together we can change the world for the better.

By now the whole world has heard of Greta Thunberg, a Swedish schoolgirl, who at age 15 chose to protest just outside the Swedish Parliament, to force adults to take immediate, real steps to tackle the planet's climate crisis. She is now a global symbol for thousands of young persons who have chosen to avoid the path of cynicism and apathy, to walk towards greener horizons.

Each one of you can make a difference. Here are just 10 easy measures that young people have listed and sent to the Sanctuary Nature Foundation that individuals can start doing. I am confident that the adults in your lives will be motivated by you to "do the right thing" themselves.

We are all part of nature's web of life.

1. Young people have decided that they are going to fix the world their elders have treated so carelessly. They do not waste electricity. They know that electricity gives rise to the demand for destructive dams, toxic nuclear power, and climate destabilizing coal, oil, and gas infrastructures.
2. By habit they do not waste water, knowing that this will be one of the most scarce resources in an era of climate change.
3. Increasingly, they are opting for public transport, they prefer to car pool, and walk short distances.
4. Young people are demanding that cities invest in footpaths, drinking water fountains, benches for the elderly, and shaded avenues to encourage people to walk short distances.
5. They do not spit in public places, nor do they litter. Very often they pick up after adults who litter. They believe in the dictum that "if a lot of us do a little, a lot can get done."
6. They understand that clean living is healthy living. They are asking their parents to avoid using household pesticides and to use cleanliness as a way to reduce pests.
7. They are suggesting that family diets include more fresh food, rather than the junk food (and wasteful packaging) that some companies want to force down Indian throats.
8. They show compassion for all other living things. They are learning that cruelty destroys one's own soul and that there are invariably better options than to harm helpless animals.
9. They understand the strength in numbers. They are uniting to support groups working for a better world. They are participating in rallies and environmental fests, and are encouraging their friends to do the same. "Extinction Rebellion" and "Climate Strikes" across the globe are just two small examples.
10. Young people refuse to stay silent. They are making their voices heard for the earth. They speak to their parents and friends and inspire people around them through their actions. They organize events, write letters to newspapers, and come out in support of local environment movements.

ACKNOWLEDGEMENT
Photographs courtesy Dr Parvish Pandya.

Our Mother Earth:

Really getting warmer?

Pradeep K. Srivastava

Some time ago, the President of the Maldives informed the media that he wanted to buy land for his country. People were surprised at this statement – why did the island country need to buy land? The answer is very simple: Maldives is on the hit list of global warming, and the elevation of land in Maldives is only an average of two metres above sea level. Any future change in climatic conditions will make the sea level rise further, affecting many countries in the world, including the Maldives. The first country to be submerged will be Tuvalu, an island in the Pacific Ocean. The people of Tuvalu are already fleeing to neighbouring countries.

Rise in sea level is the fallout of the green house effect. The gases present in the stratosphere which absorb the heat of the sun are called green house gases. The green house effect is causing global warming, due to which more than a crore and fifty lakh acres of land across the world is being converted into desert every year, and 10 crore people have become homeless. The major causes are increasing green house gases in the atmosphere, and deforestation.

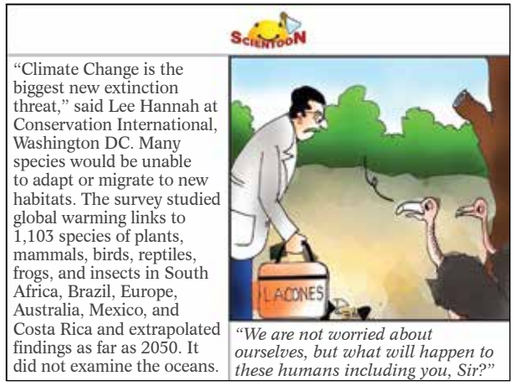
Medicinal plants originate from almost every part of the globe. In the Himalayan region, Nepal, India, and Pakistan harbour medicinal plants which are integral to Ayurvedic and other traditional medicine. Of the 265,000 species of flowering plants that have been identified on this planet, only 0.5% have been studied in detail for chemical composition and medicinal value. In fact, modern scientists know the chemical composition of less than 5% of the flora in rainforests. However, indigenous peoples who live in rainforests can identify specific uses for 49–82% of the trees in their local environment. According to a 2014 report by WWF, around 46–58 thousand square miles of forest are lost each year, equivalent to 36 football fields every minute! This is causing extensive and irreparable damage to our rich biodiversity, as many species are being lost forever, even before their medicinal value is known to us.

For various reasons, 200 known drug-yielding plants had become extinct by the end of the last century, and the loss of each plant species was worth more than US$ 203 million. This is alarming news, as drugs obtained from the plants are highly effective, well tolerated, and can be less toxic than certain modern equivalents. Plants provide us a number of vital drugs, from the pain killer morphine to anti-cancer taxol, and a great future lies ahead in plants from marine sources, which can provide us novel treatments, especially newer antibiotics. Environmental factors like global warming caused by chlorofluorocarbons, perfluorocarbons, and UV radiation, besides deforestation, desertification, and industrial pollution, may cause extinction of several medicinal plants, even before their medicinal value is known to us. In India, the Northeast and Western Ghats region are prominent among the mega biodiversity rich areas of the world. The Northeast region of India has a special kind of plant diversity which is on one hand Himalayan, and on the other hand influenced by the coastal impact of the Bay of Bengal.

"Climate change is the biggest new extinction threat,'' said Lee Hannah at Conservation International in Washington DC. Many species would simply be unable to adapt or migrate to new habitats. A survey, the largest of its kind to date, studied global warming links to 1,103 species of plants, mammals, birds, reptiles, frogs, and insects in South Africa, Brazil, Europe, Australia, Mexico, and Costa Rica and extrapolated findings as far as 2050. Yet, it did not examine the oceans.

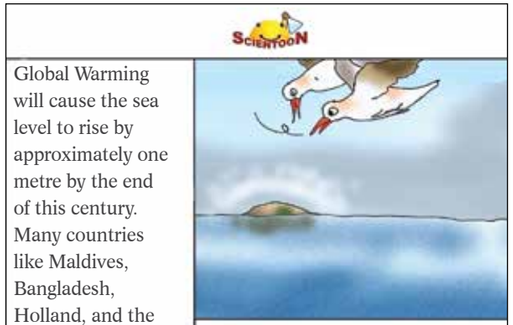
Yet another disaster caused by human intervention is the crash in vulture populations experienced since the 1990s. Vultures are scavengers, feeding mostly on the carcasses of dead animals. Vultures are found on every continent except Antarctica and Oceania. Bombay Natural History Society (BNHS) has stated that 99% of the Gyps vulture population has declined at the rate of around 50% every year. In 2008, Dr Asad R. Rahmani, Director of BNHS, said, "At present there are only 11,000 vultures remaining in India. If the decline continues at this rate, then only around 6,000 vultures will be left and finally they may become extinct."

Ailing and dead vultures have been found in neighbouring Nepal and Pakistan, and there is concern that this decline could spread to other continents where these birds play a major role as scavengers in the ecosystem. In African countries, as in India, communities depend on vultures to dispose of animal carcasses.



"Climate Change is the biggest new extinction threat," said Lee Hannah at Conservation International, Washington DC. Many species would be unable to adapt or migrate to new habitats. The survey studied global warming links to 1,103 species of plants, mammals, birds, reptiles, frogs, and insects in South Africa, Brazil, Europe, Australia, Mexico, and Costa Rica and extrapolated findings as far as 2050. It did not examine the oceans.

"We are not worried about ourselves, but what will happen to these humans including you, Sir?"

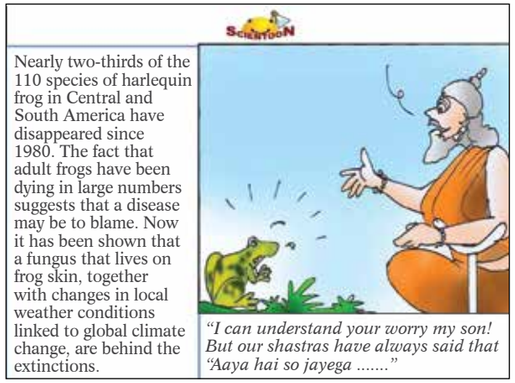


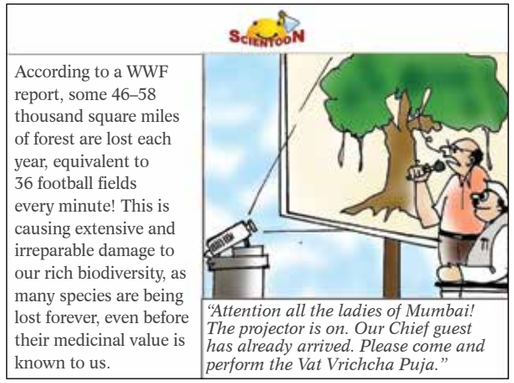
Global Warming will cause the sea level to rise by approximately one metre by the end of this century. Many countries like Maldives, Bangladesh, Holland, and the Caribbean will face a serious problem.

"Do you see that little piece of land. My grandmother told me that here used to be beautiful country called Maldives."

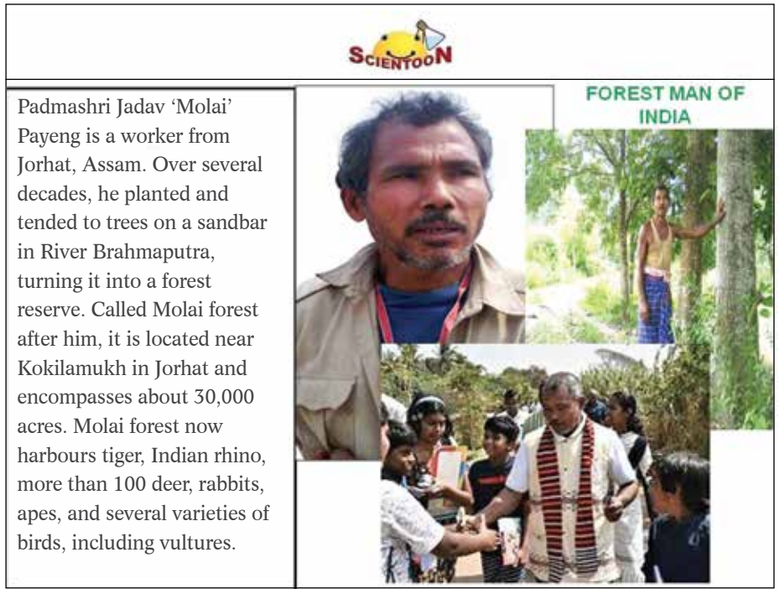
Coral reefs are unique ecosystems of plants, animals, and their associated geological framework. The ocean equivalent of rainforests, they are home to 25% of all marine species, yet it is estimated that many of the world's reefs will be destroyed or significantly damaged in the next 20 years. There are about 4,000 coral reef fish species worldwide, accounting for approximately a quarter of all marine fish species. The Great Barrier Reef, measuring 2,000 km in length, is the largest living structure on earth; it can be seen from the moon. Reefs protect human populations along coastlines from sea wave and storm damage by serving as buffers between oceans and near-shore communities. Nearly 60% of the world's remaining reefs are at significant risk of being lost in the next three decades. The major causes of coral reef decline are coastal development, sedimentation, destructive fishing practices, pollution, tourism, and global warming. Climate change threatens to destroy the majority of the world's coral reefs, as well as wreak havoc on the fragile economies of developing small island states.

In the past half century, the rich biological resources of the world have been increasingly exploited both for international trade and to sustain the growing population. The direct harvesting and export of natural products timber and fish, the expansion of agriculture into primary forests, wetlands, and grasslands, and replacement of traditional native crops with high-yielding exotic species have had severe impacts on the region's biodiversity.





We need to reach out not only to conservation experts or scientists, but will have to explore and learn from traditional knowledge, also using the latest technologies to combat this global issue of climate change and increasing greenhouse gases. The effective use of a new methodology called Scientoonics, which uses a novel concept of science based cartoons was developed by the author, coupled with an EA2 approach (EA2 = Education, Awareness, and Action) in planning a unique strategy for saving us from global warming especially for Asia and Pacific region.



The author observed on many occasions the lukewarm response of audiences to purely scientific lectures. On one such occasion, when he was informed that his lecture time had been reduced from 45 minutes to 10 minutes, he thought of delivering his lecture in the form of "scientoons, cartoons that conveyed his message in a light-hearted manner.

Use of Carbon Negative Materials in the Canvas of Ellora Caves

M. Singh and Milind Madhav Sardesai

ELLORA CAVES

The Ellora caves (20° 1' 25.61" N, 75° 10' 45.86" E) are located near village Verul, at a distance of 29.8 km northwest of Aurangabad city. Ellora was originally known as Elur or Elapura, due to its location near the Elaganga river which rises from the nearby hills. Ellora caves, locally known as Verul Leni, is a group of 34 caves representing three major religions of India, Buddhism, Hinduism, and Jainism. In 1983, Ellora Caves were declared as a World Heritage Site by UNESCO. The ancient caves of Ellora are a breathtaking example of rock cut architecture, that stand testimony to the imagination and artistry of their creators. Unlike the caves of Ajanta, the Ellora site lies on an ancient trade route and has always remained in the public eye. The caves of Ellora run approximately in a north-south direction for almost two kilometres. At the southern end are 12 Buddhist caves, while in the north there are six Jain caves. In between lie 17 Brahmanical caves. The Buddhist caves at Ellora are the earliest (550–700 CE) among the groups. Besides sculptures carved out of basalt, the caves are also famous for their beautiful frescoes painted on mud/lime ground.

Cave no. 12, from where the samples under references are collected, is remarkable and three storeyed. There are some indistinguishable traces of painting on the ceilings and walls of the inner shrine. The designs represent floral and creeper patterns and other geometric designs, jewellery designs and wood work. It is obvious that the colours of all these paintings are dull and insipid, perhaps owing to deterioration caused by weather conditions, since the caves are exposed to the sun and rain.

THE PAINTINGS

Indian painting has a history of over 10,000 years, when prehistoric man first adorned his rock cave shelters with painting, as seen in the Narmada valley. However, there are many uncertainties in our knowledge, especially during the early historic period. The chronology of Ellora is uncertain, compared to Ajanta and Aurangabad caves. Unfortunately, the murals of these caves and also of Aurangabad caves now are reduced to minute remnants of paintings. Hence, no publications are available on the mural paintings at Ellora and Aurangabad caves. A large portion of these paintings has been destroyed, mainly through the detrimental effects of nature, human vandalism, and neglect.

USE OF MARIJUANA

Cannabis is one of the oldest domestic plants in the history of mankind and has probably been utilized for more than 10,000 years. In India, it is popularly known as bhang or ganja and its domestication dates back during 5000–4000 BCE. It was cultivated for multiple purposes, for the fibre from its stem, edible food/oil from its achene, medicine, and psychoactive substances in its resin glands. These plants secrete terpenophenolic compounds called cannabinoids that are unique to Cannabis. Tetrahydrocannabinol, one of the most abundant cannabinoids, is psychoactive.

The Ayurvedic system and Siddha systems of Indian medicine contain a number of references to Cannabis. Medicinal use of Cannabis was first recorded in India in the medical work of Sushruta, compiled around 1000 BCE. Later it was recorded in ancient Persia about 600 BCE. Cannabis has also been listed in Indian texts such as the *Tajnighuntu* and the *Rajbulubha*. According to this literature, it is used in the treatment of phlegm, digestive disorders, inducing costiveness, sharpening memory, increasing eloquence, as an appetite stimulant, for gonorrhea, and as a general tonic. The plant is used in the Hindu culture for certain rituals during Shivratri festival. The ancient medicinal, ritual, and psychoactive uses of Cannabis are often difficult to separate. The intoxicant value of Cannabis played different roles in different nations and cultures in ancient time.

SAMPLE DISSECTION AND COMPARISON

Fallen samples of mud plaster were collected from cave no. 12, which is a Buddhist cave. The specimens isolated from the samples include pounded pieces of shoots, fragmented leaves, and a single (male?) flower. For identification, the samples were examined and photographed under Scanning Electron Microscope and the pounded pieces of shoots were examined and measured with a light microscope. The flower and leaves were examined and photographed under a stereo-microscope. For comparative studies, live specimens were collected along the roadside from the outskirts of Delhi. It was confirmed that the specimens embedded in plaster were of *Cannabis sativa*, as no difference could be found between the archaeological sample and modern plants.

USE OF CANNABIS IN CONSTRUCTION

Poor moisture control in heritage and stone wall buildings (studied in the United Kingdom) leads to mould growth and structural damage to the building. There are concerns regarding an increased risk of internal condensation as air tightness improves and interstitial wall moisture ingress, either due to membrane failure or liquid water surface diffusion. These risks are of particular concern with regard to maintaining the integrity of heritage buildings.

Hemp and binder is an insulating matrix, which is used as an internal insulating render and can provide improved thermal efficiency in both the hot and cold season, although its overall thermal effectiveness remains unreported. It also potentially controls both internal and interstitial moisture fluctuations due to its hygroscopic properties, reducing the need for increased air flow to prevent surface condensation.

There is much accumulation of moisture due to increased and uncontrolled number of tourists visiting the Ellora caves, which leads to uncontrolled amount of humidity inside the caves. Moreover, there is additional potential for interstitial condensation on the outside surface. Further, rain penetrating into the external side of the wall permeates inwards, following the temperature gradient to fluctuate. This moisture leads to condensation and has a tendency to build up in the wall as external evaporation is reduced and internal evaporation is prevented. These effects also increase the likelihood of damage which can be severe and lead to structural damage. There is no need for a vapour barrier between the insulation and the wall, as the porous wall will take up any condensate and release it again when conditions change. However, this is presuming that no condensation will occur within the insulation and that the insulation is inert to acute moisture damage, which is true with synthetic materials but not natural materials.

HEMPCRETE OR LIMECRETE TECHNOLOGY

Hemp and binder (e.g. lime, cement, and clay) is an insulating middle weight matrix that is strongly hygroscopic, with a high capillarity and moderate moisture buffering potential. It is used as an internal insulating material, which provides improved thermal efficiency in both the heating and cooling season. It also potentially controls both internal and interstitial moisture fluctuations due to the hygroscopic properties of Cannabis, reducing surface condensation.

The remains of hemp unearthed mainly in Eurasia are carbonized or decayed because of the climate and storage conditions. Remains of Cannabis are also known from the Yanghai tombs located in the Turpan Basin. These remains are the oldest examples of Cannabis thus far reported. Moreover, the materials provide significant information on the ancient civilization of the Turpan area, and about the utilization of hemp. The remains of Cannabis from the samples under study suggest that it was used with clay as an insulating agent as well as to provide a degree of strength.

SEX ALTERATION IN CANNABIS

In the natural course, higher temperatures and low humidity increase the probability of Cannabis plants developing all male, while lower temperatures and high humidity favour the development of female plants. This can also be altered artificially by providing low nutrition and supplementary hormones. The samples which were examined from Ellora cave did not show any fruit or seed, suggesting that the plants used in the plaster were male plants. This does not in any way suggest that the female (bhang yielding) plants were consumed for intoxication, as the Fifth Precept of Buddhism forbids the use of narcotics in any form.

Condensed from the authors' talk at the FOT National Seminar.

Impact of Climate Change on Water Resources

Text & Images: Murari Ratnam

A scarce natural resource, water is fundamental to life, livelihood, food security, and sustainable development. Water is also one of the most manageable of the natural resources, as it may be diverted, transported, stored, and recycled. Because of all these properties, water has great utility for human beings. Water resources available in the form of surface water and ground water are utilized to meet the increasing demands in various sectors, which include drinking water, agriculture, hydropower generation, livestock production, industrial activities, forestry, fisheries, navigation, recreational activities, and ecological requirements.

Water occupies 70% of the earth's surface. Out of the total available water, 97% is sea water while the remaining 3% constitutes fresh water. Of the freshwater resources available, 87% is not accessible, while 13% is available to living organisms, including humankind. In short, only 0.4% of the global water constitutes available resource. Fresh water can be found in four easily identifiable places on the earth, namely streams and rivers, ponds and lakes, groundwater, and dams and reservoirs.

The hydrologic cycle is the perpetual movement of water throughout the various components of the earth's climate system. Water is stored in the oceans, in the atmosphere, as well as on and under the land surface. The transport of water between these reservoirs in various phases plays a central role in the earth's climate. Water evaporates from the oceans and the land surface into the atmosphere, where it is advected (advection = the transport of a substance by the flow of a liquid) across the face of the earth in the form of water vapour. Eventually, this water vapour condenses within clouds and precipitates in the form of rain, snow, sleet, or hail, back to the earth's surface. This precipitation can fall on open bodies of water, be intercepted and transpired by vegetation, and become surface runoff and/or recharge groundwater.

Water that penetrates the ground surface can percolate into deeper zones to become a part of groundwater storage, to eventually reappear as stream flow or become mixed with saline groundwater in coastal zones. In this final step, water re-enters the ocean from which it will eventually evaporate again, completing the hydrologic cycle. The hydrologic cycle is conceptually depicted in figure 1. Any change, howsoever small, in this cyclic process has far reaching qualitative and quantitative effects on water resources.

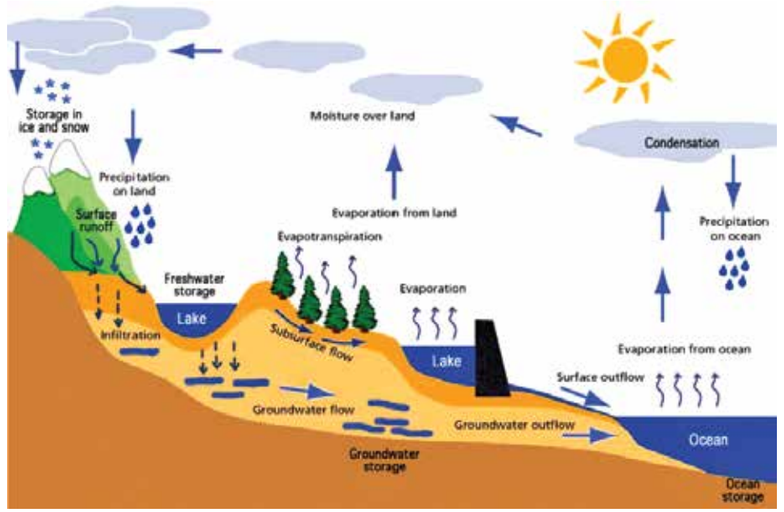


Fig. 1: Hydrological cycle.

GREENHOUSE EFFECT AND CLIMATE CHANGE

The United Nations Framework Convention on Climate Change (UNFCCC) defines Climate Change as: 'a change of climate which is attributed directly or indirectly to human activities that alter the composition of the global atmosphere and which are in addition to natural climate variability observed over comparable time periods'. The relationship between climate change and the greenhouse effect is dealt with briefly below.

The Sun powers our earth's climate, radiating energy at very short wavelengths, predominantly in the visible or near-visible (i.e. ultraviolet) part of the spectrum. Roughly one-third of the solar energy that reaches the top of earth's atmosphere is reflected directly back to space. The remaining two-thirds are absorbed by the surface and, to a lesser extent, by the atmosphere. To balance the absorbed incoming energy, the earth must, on average, radiate the same amount of energy back to space. Because the earth is much colder than the Sun, it radiates at much longer wavelengths, primarily in the infrared part of the spectrum (figure 2). Much of this thermal radiation emitted by the land and ocean is absorbed by the atmosphere, including clouds, and re-radiated back to earth. This is called the greenhouse effect. The glass walls in a greenhouse reduce airflow and increase the temperature of the air inside. Analogously, but through a different physical process, the earth's greenhouse effect warms the surface of the planet. Without the natural greenhouse effect, the average temperature at earth's surface would be below the freezing point of water. Thus, earth's natural greenhouse effect makes life as we know it possible. However, human activities, primarily the burning of fossil fuels and clearing of forests, large scale industrialization, etc., have greatly intensified the natural greenhouse effect, causing global warming. Increasing amounts of such gases as carbon dioxide, chloro fluoro carbons (CFC), methane, and nitrous oxide in the atmosphere are the primary causes of this effect, and are also called greenhouse gases. Water vapour and ozone are also known to contribute to the greenhouse effect. These gases trap the heat from the sun, and cause a gradual rise in the temperature with consequential effect on the climate.

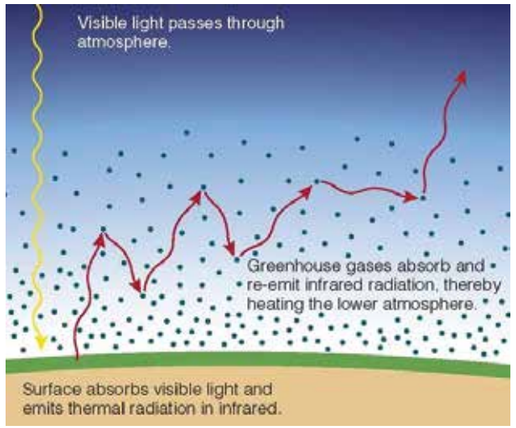


Fig. 2: Effect of greenhouse gases.

The leading UN body dealing with the subject of climate change is the Intergovernmental Panel on Climate Change (IPCC). It was established by the United Nations Environment Programme (UNEP) and the World Meteorological Organization (WMO) in 1988, to provide policy makers with regular scientific assessments concerning climate change, its implications and potential future risks, as well as to put forward adaptation and mitigation strategies. IPCC assessments provide governments, at all levels, with scientific information that they can use to develop climate policies. IPCC assessments are a key input into the international negotiations to tackle climate change. IPCC reports are drafted and reviewed in several stages, thus guaranteeing objectivity and transparency.

TEMPERATURE

According to the latest reports, human activities are estimated to have caused approximately 1.0° C of global warming above pre-industrial levels (1850–1900), with a likely range of 0.8–1.2 °C. Global warming is likely to reach 1.5 °C between 2030 and 2052, if it continues to increase at the current rate. Long-term warming trend observed in the global mean surface temperature (GMST) for the decade 2006–2015 was 0.87 °C higher than the average over the pre-industrial period. Global warming greater than the global annual average is being experienced in many land regions and seasons and is also generally higher over land than over the ocean. It is more pronounced in the Arctic region. Climate-related risks for natural and human systems are higher for global warming of 1.5 °C than at present. These risks depend on the magnitude and rate of warming, geographic location, levels of development and vulnerability, and on the choices and implementation of adaptation and mitigation options. Efforts are on to restrict or lower the temperature rise to much less than 1.5 °C. Mitigating and adapting technologies revolve around this global resolve.

The IPCC Report (2007) clearly shows that the average global surface air temperature increased by 0.74 +/- 0.18 °C since the late 19th century. The linear warming trend over the last 50 years (0.13 °C per decade) is twice that for the last 100 years (see figure 3).

The trend and magnitude of global warming over the Indian Subcontinent over the last century has been consistent with the global trend and magnitude. Mean annual air temperature rose at the rate of 0.57 °C per 100 years during 1881–1997. Annual mean, maximum, and minimum temperatures averaged over the country as a whole show significant warming trend of 0.16 °C, 0.17 °C and 0.14 °C per decade respectively, since 1981. Maximum warming trend is seen during the post-monsoon season. The annual average temperature over the Indian landmass has significantly increased in the region north of 20° N. The number of warm days and warm nights has significantly increased over the last 35 years.

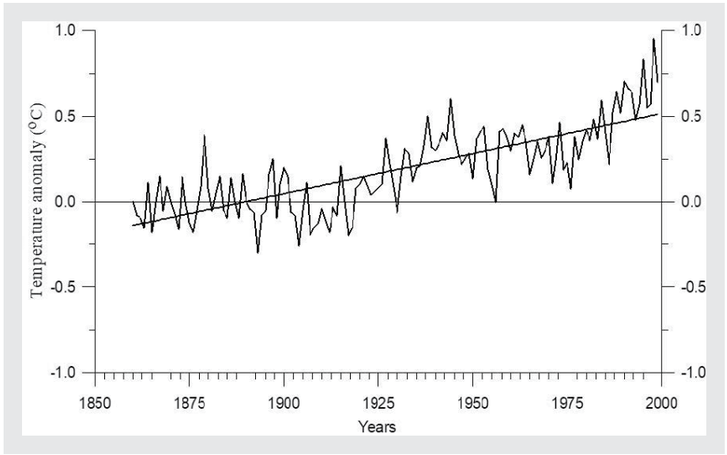


Fig. 3: Observed rise in global mean temperature since 1860, relative to the average of observations over the period 1900–1930.

IMPACT OF CLIMATE CHANGE ON WATER RESOURCES

The effect of climate change on global water resources depends on both 1. Climatic factors and 2. Non-climatic factors. The latter include:

- Population growth
- Changes in economy
- Development of new technologies
- Changes in watershed characteristics
- Watershed management

Both climatic and non-climatic factors are a challenge to policymakers, especially when the negative impact of climate change is increasing across the globe. Only climatic factors with a few examples are discussed in this paper. The hydrologic cycle, a fundamental component of climate, is likely to be altered in important ways by climate change, which would result in:

- Overall change in precipitation pattern;
- More rainfall in lesser time;
- Increase/decrease in number of rainy days;
- Sea level rise;
- Increased glacial melt-runoff initially and then subsequent decrease;
- Increase in runoff but less groundwater recharge;
- Increase in flood events particularly flash floods;
- Increase in drought-like situations.

An important factor, namely rainfall pattern variation is discussed in this paper.

RAINFALL PATTERN VARIATION

Changes in rainfall and other forms of precipitation will be one of the most critical factors determining the overall impact of climate change. Rainfall is much more difficult to predict than temperature, but there are some statements that scientists can make with confidence about the future. A warmer atmosphere can hold more moisture, and globally water vapour increases by 7% for every degree centigrade of warming. How this will translate into changes in global precipitation is less clear, but the total volume of precipitation is likely to increase by 1–2% per degree of warming. There is evidence to show that regions that are already wet are likely to get wetter, but details on how much wetter and what impacts there will be on a local scale are more difficult to ascertain. The dry regions of the subtropics are likely to get drier and will shift towards the poles. For much of Europe, wetter winters are expected, but with drier summers over central and southern Europe.

It is likely that in a warmer climate heavy rainfall will increase and be accompanied by a few more intense events. This could lead to longer dry spells and a higher risk of floods. Early signs of increased occurrence of flood or drought in certain regions are being noticed.

The annual as well as seasonal (June through September) monsoon rainfall over India shows significant decreasing trend over the core monsoon zone, north-eastern parts and southern parts of the west coast. The total number of consecutive dry days with spell length more than five days has increased significantly, while the total number of consecutive wet days has shown significant decrease.

Scientists are increasingly attributing the following events to climate change:

- Serious and recurrent floods in Bangladesh, Nepal, and India
- Torrential rainfall in Mumbai (India) in 2005 and subsequent devastation
- Intense rainfall in Uttarakhand (India) and subsequent devastation in June 2013
- Droughts in Orissa (India) in 2000–02, accompanied by crop failure and mass starvation.

CASE STUDY: MUMBAI

A case study of torrential rainfall and consequent urban flooding in a highly congested city is briefly dealt with. Mumbai, a coastal city, experiences a tropical climate with two main seasons, the wet (southwest monsoon) and the dry (northeast monsoon). The wet season (June–September), is characterized by high humidity and daily maximum temperatures of over 30 °C. The total annual average rainfall received by the city is 2,401 mm, of which more than 95% occurs during the southwest monsoon between June and September.

The onset of the southwest monsoon in Mumbai and adjoining areas is associated with a sudden increase in rainfall and decrease in temperature along the coastal areas of India. On certain occasions, rainfall exceeds 200 mm per day. Historical data indicates that Mumbai has received more than 200 mm of rainfall in a single day on 50 occasions and more than 300 mm on 13 occasions. The extreme rainfall event of July 26, 2005 resulted in the highest 24-hour rainfall ever recorded in Mumbai.

Table 1: Precipitation in Mumbai, July 26, 2005

Locality	(Rainfall in mm)
Tansa Lake	50
Bhandup	81
Vihar Lake	1045
Santacruz	944
Dharavi	499
Malabar Hill	74
Colaba	73
Bhira	121

The rainfall varied greatly from the northern part of the city to its tip in the southern direction (Table 1).

Receding glaciers are a direct consequence of global warming.

Global Warming and Climate Change

A forester's perspective

Text: Ajit Sonakia, IFS (Retd)
Photographs courtesy Dr Ashok Kothari

Rise in the earth's temperature and resultant climate change phenomena due to burning of fossil fuel was first identified by the German scientist Arrhenius in 1896. And today we have reached a point where the issue of "Global Warming and Climate Change" is one of the most burning problems, and which the human race has faced since its advent on planet earth. Anthropogenic activities have resulted in raising the level of greenhouse gases in the atmosphere in general and the level of carbon dioxide in particular. This negative influx of carbon is at the root of rising earth temperature, which is the main cause of climate change. Industrialization and developmental issues have overshadowed all concerns in the human mind. At the same time, a balance must be maintained between developmental needs and what is good for nature and Mother Earth. Now, due to research and studies, the realization has dawned on humankind that we need to decelerate this "progress", and that we must work to make the planet livable again.

The subject of global warming and climate change has come to prominence in every walk of life, be it our lifestyle, food, health, transport, commerce, or politics. The issue of climate change cannot be discussed in isolation; it has to be understood in conjunction with the problem of global warming, as global warming has initiated the disaster named climate change. Since the formation of earth, global warming has been a constant phenomenon taking place on this planet. After the advent of life on earth, the climate took many turns and swings which favoured some species and eliminated others. Some of the significant occurrences which changed or modified the climate on earth were volcanic eruptions, solar variations, impact of interstellar bodies, continental drift, earth-sun geometry, etc.

But after the advent of man, another dimension was added to this process, which proved to be more sinister than the rest. This dimension was termed anthropogenic activities. Even this

Maintenance of forest cover is a global necessity.

was not enough, as the rate at which anthropogenic activities contribute toxic emissions got an upswing after the process of industrialization started in the 19th century. Anthropogenic emissions, a byproduct of human activities, mainly comprise six gases, namely carbon dioxide, methane, sulphur dioxide, nitrous oxides, hydrofluorocarbons, perfluorocarbon, and sulphur hexafluoride.

The emission percentage of carbon dioxide is the highest amongst these gases. The next is methane, which is unstable in atmospheric conditions and soon breaks down into carbon dioxide and water vapour, thus raising the level of carbon dioxide in the atmosphere. As these gases are released and rise upwards, carbon dioxide settles first and forms a blanket surrounding the earth. This blanket blocks the heat energy of earth and the reflected solar energy, thus raising the earth's temperature. This phenomenon is known as the greenhouse effect, and therefore these six gases are called greenhouse gases.

Further than the greenhouse effect, the remaining gases rise to the stratosphere, reaching a height of 25 to 30 km. Here they enter the ozone layer. In this layer of the earth's atmosphere, ozone is present in a concentration of 2 to 8 ppm (parts per million). This gas blocks the ultraviolet rays coming from the sun. High levels of ultraviolet radiation can be harmful for almost all the life forms on earth. They damage the haemoglobin carrying red blood cells, and chlorophyll in plants. Excessive UV rays can cause the growth of cancers, cataract, skin disease, and many other health problems.

Scientific studies have projected that during the last 400,000 years, the concentration of carbon dioxide never went above 288 ppm, but after 1950 or the period when large-scale industrialization began in America and Europe, carbon dioxide levels in the atmosphere started rising and today it stands at 409 ppm. This rise has caused the rise in earth's temperature. Since the main factor behind this rise is carbon dioxide, the talk in common parlance is of reducing carbon emissions.

Wetlands and coastal areas must be protected at all costs.

The main sources of greenhouse gas emission can be summarized as:

1. Carbon dioxide: Burning of fossil fuel, deforestation, degradation
2. Methane: Natural gas, landfills, fermentation, peat bogs, burning of fossil fuel
3. Nitrous oxides: Transport/Power/ Fertilizer Industries, burning of fossil fuel
4. Hydrofluorocarbon: Refrigeration
5. Perfluorocarbon: Aluminium production
6. Sulphur hexafluoride: Semiconductor industry

Destruction of forest habitats affects all biodiversity, elephant corridors being an example.

Climate as a phenomenon is determined by the conditions across 30 to 40 years, or even more for the duration of observations or its projections. The earth's climate is constituted by three important components, namely Air, Water Vapour, and Temperature. Temperature plays the most important role in affecting the climate of a particular region. It causes air flow and moisture content therein, which in turn regulates rain and snowfall. However, it must be remembered that these are the most important processes that we are discussing here; other factors and processes do influence the climate in one way or the other.

The impact of rising temperature has resulted in climate change. This has been experienced in melting of polar ice shield and glaciers, decaying coral reefs, loss of forest cover, drying rivers, changing agricultural patterns, decreasing marine catch, rising sea level, spread of vector borne diseases, floods, drought, rising frequency and strength of storms, typhoons, and tornadoes, thawing of permafrost, damage to coastal installations, population displacement, extinction of species with loss in their range, declining water table, decreasing availability of potable water, to name the most disastrous. Many more impacts are being experienced all over the world. The impact of drying rivers is directly felt by inland populations, while the larger impact on agricultural production affects all. Rivers and adjoining forests need our urgent attention. It is significant to mention here that snow-fed rivers call for emission reduction and containment of global warming.

The question remains, which anthropogenic activities are the primary sources of GHG emission? The following play an important part:

1. Power Generation, mostly thermal: 51%
2. Transportation Sector: 16%.
3. Steel Industry: 10%
4. Cement Industry: for 4%
5. Chemical Industry: 3%
6. Paper Industry: 1%
7. Others including MSW: 15%.

These sectors do need our urgent attention. It is important to remember that an emission may occur locally, but its impacts are global, and the vulnerable suffer the most, poor underdeveloped and developing countries. Another monster lurking around us is plastic, which has become a necessary evil in our daily lives. The big question remains, what should be done to tackle the most disastrous situation humans have faced since their dawn on planet earth? The ongoing and proposed efforts can be classified into the following categories:

A. INTERNATIONAL ACTION

The UN has initiated a dialogue and action under the aegis of UNFCCC in the form of Conference of Parties (COP). The landmark united actions were Berlin 1995 COP-1, Kyoto COP-3, and 2015 COP-21 Paris. The participating countries in international agreements and protocols stand around 200. However, the USA walked out of the Paris Agreement, thwarting the progress made in combating global warming and climate change, and keeping 1.5 degree below pre-industrial era.

Prime Minister Shri Narendra Modi succeeded in forging an International Solar Alliance headquartered

Loss of forests has driven even the gaur out of its natural habitat.

at Gurugram (Haryana) with France as the major contributor. Another prominent contribution was his appeal to citizens of all countries to go for a "Just and Reasonable Lifestyle" at the Paris Summit.

B. NATIONAL ACTION

The Ministry of Environment, Forest and Climate Change has been entrusted to coordinate all national efforts to combat the problem. An action plan to deal with climate change related issues and achieve the Nationally Determined Contributions (NDC) under the Paris Agreement at COP-21 is being implemented. The other responsibilities are collection of data for NASCOM as regular submissions to UNFCCC. Energy Conservation & Audit, Cleanliness Mission, Ujjwala Scheme, and Increasing Alternative Energy Production are some other path-breaking initiatives of the Government of India.

C. INSTITUTIONAL ACTION

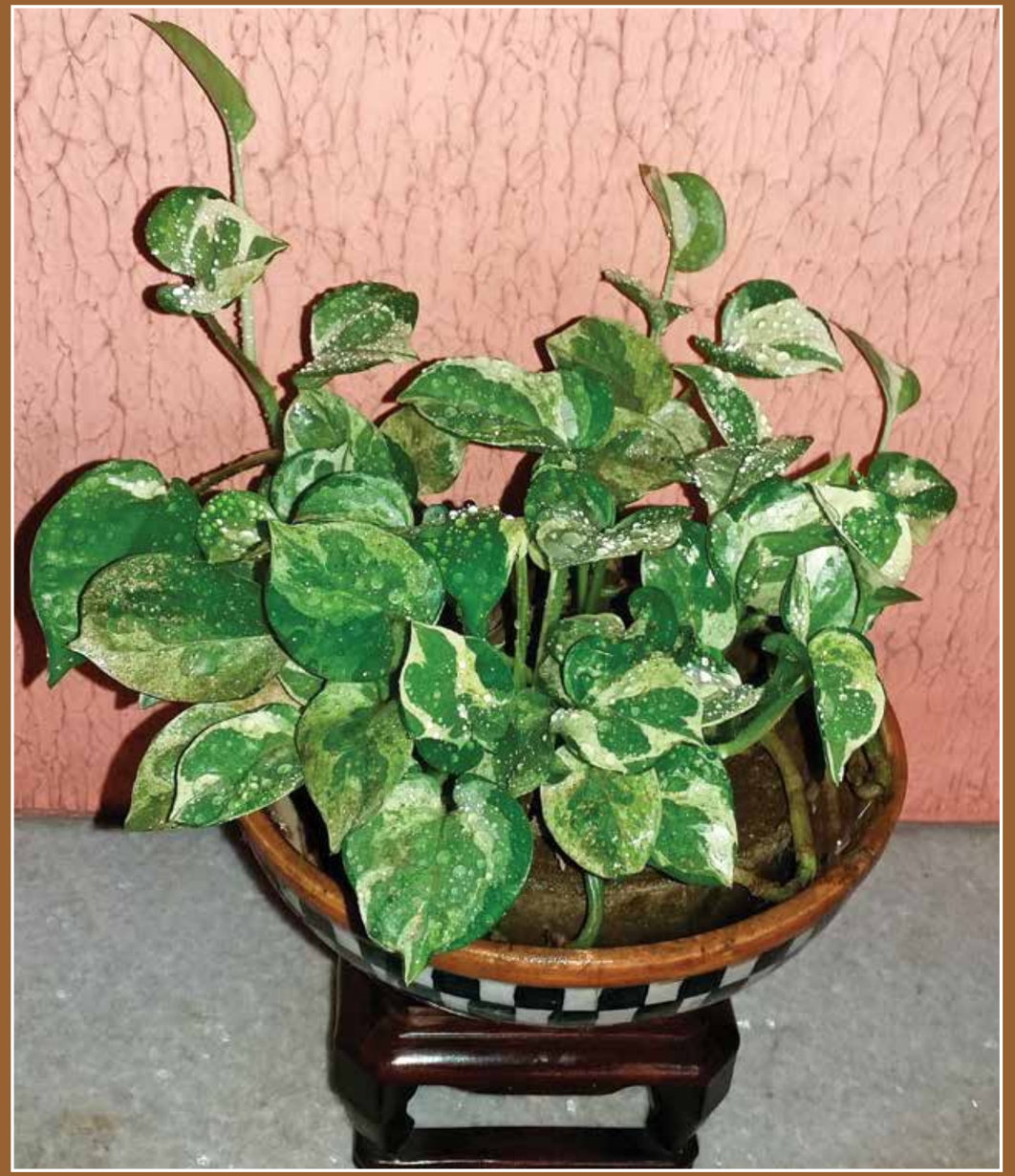
Institutions like St Xavier's College Mumbai, TERI, NEERI, IISc, ISRO, MNIT, and EPCO are working in this direction to study the facts and spread awareness among the general public, with youth in particular. Corporate Social Responsibility is an important action which corporate houses owe to the people and to the earth to compensate for the damage caused by production related emissions.

D. INDIVIDUAL ACTION

The most important fighter against climate change is you, or better still, I. Individually, this author has contributed though a book titled "Defying the Inevitable" and innumerable presentations on global warming and climate change in schools and colleges to raise awareness among the youth. Whether we like it or not, we will have to adopt a sustainable lifestyle.

And last but not least, we must listen to the discordant voices also. Development is equally important, since we need electricity, roads, vehicles, industries, high input agriculture (to feed 7.5 billion people by 2020). Disparity among the people and poverty must also be borne in our minds. The world is a group of more than 200 countries with divergent interests and we will have to live with this diversity.

We have only this planet to live in or perish. Therefore, we should heed nature's warnings and not allow the problem to go beyond the point of no return. Everyone should join hands in combating the menace of climate change without falling into the trap of greed and selfishness. As Mahatma Gandhi rightly said, "There is enough on Earth for everybody's need but not for everybody's greed."



In the Wonder World of Botanical Names

V.M. Meher-Homji

I hesitated to send this article to *Vanashobha*, thinking that the topic would be too dull for a journal publishing amazing facts of about the Plant Kingdom, little known details from four corners of our planet, and magnificent photographs. On second thoughts, I felt that botanical names are not uncommonly used in *Vanashobha*, and that readers may like to know something about the scientific names given to those denizens of planet earth that do not demand anything more than air, a little water, soil, and sunlight for their existence.

To a layman, tongue-twisting names like *Chrysalidocarpus* or *Cardiospermum halicacabum* may appear to be Latin and Greek, and many of these names are indeed derived from Latin according to the earlier rules of taxonomic nomenclature, and even Greek. Practically every name arouses our curiosity.

Morphological resemblances produced through evolutionary processes have enabled taxonomists to grade the organisms into families, genera, and species. The classical binomial nomenclature of Linnaeus led to grouping of plants into genera and species. The naming game provided opportunities to exploit various features to label the genera and species. Names of eminent botanists were used to denote genera like *Ludwigia* after Ludwig, *Adansonia* after Adanson, and *Salvadora* after Salvador. Also the specific epithets like *hookeri* derived their names after botanists of exceptional merit like Hooker, the author of Flora of India or *santapaui* after Rev. Fr H. Santapau, who promoted the discipline of botanical taxonomy in India. Occasionally, historic characters were also invoked: The genus *Cicer* (Bengal gram) alludes to the mole on the nose of Cicero and the species *lachryma-jobi* to Job's tears.

ASHOK KOTHARI

Hyphaene indica is a species named after India.

ASHOK KOTHARI

Plumeria alba is named after its white flowers.

Cereus hexangularis has a hexagonally shaped stem.

Ficus bengalensis has a place name, as it was described from Bengal.

Colours of flowers have a role to play: *rubra* (red), *rosea* (pink), *purpurea* (purple), *alba* (white), *argentea* (silvery). The species of lily that bears beautiful flowers is aptly termed *Gloriosa superba*.

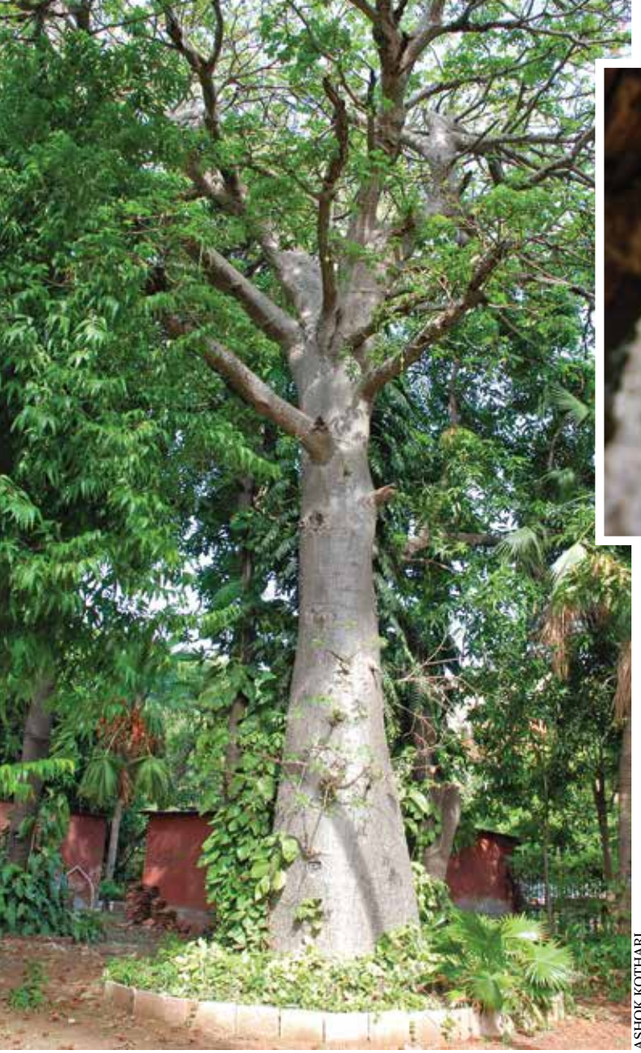
Striking morphological features attract attention in the name scheme.

Characteristics of leaf are widely used: *longifolia*, *latifolia*, *pentaphylla*, *pinnata*, *bipinnata*, *digitata*, *equisetifolia* (leaf resembling the tail of horse), *Sagittaria sagittifolia* (arrow-shaped), *biloba* (two-lobed), *hispida* (hairy), *glabra* (smooth). Species names *acuta* and *obtusa* refer to the leaf apex, whereas *umbraculifera* refers to the inflorescence of the palm *Corypha*. Species dropping their leaves periodically receive names like *aphylla*, *decidua*, and *caducifolia*.

Among names based on the features of the trunk or stem may be mentioned *arborea*, *grandis*, *giganteus*, *scandens*, *erecta*, *prostrata*, *quadrangularis*, and *spinosa*.

Economic products obtained from the plant are employed to denote the taxa, such as in edible oils, we have *olea* (Olive), *oleoides*, *oleifera*, and for sugar we have *Saccharum*.

Habitats also feature in nomenclature, like *arenaria* (sandy), *littoralis*, *marina*, *riparia* (stream bed), *sylvatica* (forest inhabitant), *campestris* (from the fields).



ASHOK KOTHARI

ASHOK KOTHARI

Adansonia digitata, the species name is derived from the fingerlike arrangement of the leaves.

Saponaria refers to a plant yielding a soapy product. Plants with medicinal value have received specific names related to their therapeutic properties, like *antidysenterica*, *somnifera*, and *camphora*.

Also, *sativa*, *sativum*, *esculentus*, *esculentum* refer to food items: *Oryza sativa* is rice, green peas are *Pisum sativum*. *Hibiscus esculentus* is vegetable bhindi or okra and *Lens esculentum* is lentil.

Winged fruits and seeds find a place in nomenclature: *Pterocarpus*, *Dipterocarpus*, *Pterolobium*, *pterygosperma*.

Religious sentiments are expressed through terms like *religiosa* (*Ficus religiosa* – the peepal tree), and *sanctum* (*Ocimum sanctum* – tulsi), our sense of smell through *aromaticum* and *foetida*. *Helianthus* (sunflower) and *Heliotropium* bear reference to the movement of the sun.

Vernacular names have served to name genera like *Putranjiva*, *Madhuca*, *Vanda*, and species *carandas*, *deodara*, *cadamba*, and *arjuna*. *Tirucalli* derives its name from Tamil Thiru (meaning sacred) and *kalli* (meaning a shrub with latex).

Human anatomy has not been spared in the naming scheme: *Cardiospermum*, *Phallus* (a mushroom) with the specific epithet *impudicus* (shameless), *Pennisetum* (pearl millet), *Clitorea*, *vaginatus* (meaning sheathed).

Examples are available wherein the generic name of one plant is used to denote the specific name of another – for instance *Swietenia macrophylla* and *Chloroxylon swietenia*. Other examples are *Ilex* and *ilicifolius*, where the leaf of the mangrove *Acanthus ilicifolius* resembles that of *Ilex* (holly) or *Corylus* and *corylifolia*, whereas the leaf of *Psoralea corylifolia* resembles that of *Corylus*.

Finally, there is the strange case of genus *Cepadasa* – pronounced the French way – *c'est pas de ca* – meaning "It is not that."

This brief account is based on what I could recollect from memory. Full details may result in volumes. Documents on this subject may be available elsewhere; here I have presented my views. In Sen'trees' of Mumbai (edited by S.B. Chaphekar, C.S. Lattoo, and M. Karnik, published by ONGC), many such interesting facts related to plant species names and their etymology have been presented; one example is *Tamarindus*, sourced from the Arabic *tamr-i-hindi* – meaning "date of India". My thanks are due to Prof. Chaphekar and Prof. Lattoo for ideas for this article.

Plants in the Treatment of Cancer

Text and Photographs: C.S. Lattoo

Cancer is a major disease around the world, with high mortality rates. However, due to recent advances in medical science, there is a decrease in the death toll. Early diagnosis of the disease is the key to increased possibilities of cure. Cancer is caused by numerous internal and external factors. The available treatment methods include radiation therapy, chemotherapy, and surgery. Patients who have to undergo chemotherapy suffer from the maximum problems and discomfort, even due to the treatment itself.

Recent research carried out by Board of Radio and Isotope Technology (BRIT) at Bhabha Atomic Research Centre at Trombay in Maharashtra has made it possible to specifically target only cancer cells very effectively, without affecting the adjoining healthy cells. The application of this technology will definitely reduce patients' agony, and will also help to minimize the side effects of the treatment. Primarily, this technology has been proved successful in thyroid cancer, and is also being studied on other types of cancer.

In this article, some plants used in the treatment of cancer have been described. To use plants in any kind of treatment, the plant must first be correctly identified. The active ingredient present in the plant, related to the treatment, must be identified and it should be known in which parts of the plant the active ingredient exists.

Here I have given brief descriptions, such as habit, habitat, and morphology, with photographs of some of the plants used in cancer treatment, to show what the plant looks like.

1. *Catharanthus roseus* (L.) G. Don.
Family Apocynaceae (Dogbanes).
Common name: Periwinkle.
Evergreen and sturdy, it is a tall herb, growing 20–60 cm in height. Leaves oval, shining green. Flowers white or pink, with basal tube. Corolla 2–5 cm across. The plant is a native of Madagascar, and naturalized throughout sub-tropical Asia, Africa, and America. It is known as a miracle cure for leukaemia and other cancers, and has been in use in traditional herbal medicine. Western medical science started researching on the anti-cancer properties of this plant in the 20th century.

Withania somnifera

Semecarpus anacardium

Camptotheca acuminata

Nothapodytes nimmonina

Tinospora sinensis

Periwinkle yields two important bioactive alkaloids, namely vinblastine and vincristine, which are key compounds in the treatment of various types of cancer. The complex nature of these two compounds renders them difficult to synthesize in the laboratory.

2a. *Podophyllum peltatum* Linn.
Family Berberidaceae.
Common name: May Apple.
Found across the deciduous forest regions of eastern North America, this herbaceous perennial develops from a creeping rhizome. The stem grows 30–40 cm long, with palm-like or umbrella-shaped lobed leaves. Flowers are white, yellow, or red, and 2–6 cm across. Fleshy fruits are 2–5 cm long. All parts of the plant are poisonous, but the fruits are edible when ripe.

Curcuma longa

May Apple has been used by American Indians as an emetic, cathartic, and antihelmintic agent.

2b. *Podophyllum emodi*
syn. *Podophyllum hexandrum*.
Family Berberidaceae.
This species is native to the Himalayan region (specifically Uttarakhand). It is a succulent, erect herb, with one or two palmate lobed leaves, which are up to 25 cm in diameter, deeply divided into 3–5 lobes, toothed and purple-spotted. Flowers are white to pink, 4 cm across. Fruit is 5 cm long, ovoid, pulpy, and scarlet when ripe.

Cannabis sativa

Taxus wallichiana

Two derivatives of podophyllotoxin called etoposide (trade name VP-16) and teniposide (trade name Vumon) are employed in the treatment of various cancers. It is especially effective in skin cancer.

3a. *Taxus baccata* Linn.
Family Taxaceae (gymnosperm).
Common name: English or European Yew.

3b. *Taxus wallichiana* Zucc.
Family Taxaceae (gymnosperm).
Common name: Himalayan Yew.

Currently classified as endangered by IUCN. Evergreen trees, tall with massive trunk. These are native to Europe, northwest Africa, Iran, and southwest Asia. All parts of these plants are toxic to humans, due to alkaloids present, except the berries, though the seeds are toxic too.

The effective chemical is paclitaxel (PTX), sold under the name Taxol, which has anti-cancer properties. Paclitaxel is used to treat ovarian, breast, lung, and pancreatic cancers. Two chemotherapy regimes were developed from yew trees.

i) Docetaxel was first made from the leaves of European Yew *Taxus baccata*.
ii) Paclitaxel (Taxol) was made from the bark of Pacific Yew *Taxus brevifolia*.

Both drugs can now be made synthetically in the laboratory. Dabur, an Ayurvedic pharma company, has perfected the method of taxol extraction from Himalayan Yew. The Indian drug is cheaper than the foreign products, since it is extracted from leaves and not from bark.

4. *Nothapodytes nimmoniana* (J. Graham) Mabb.
Family Icacinaceae.
Common name: Ghanera or Amruta.
A small, moist deciduous to evergreen tree with smooth wrinkled grey bark. Leaves large, egg shaped, crowned at the end of branches. Flowers cream coloured, emitting a foul smell (hence Ghanera), fruit long, purplish-black when ripe.

The plant contains camptothecin, the active constituent used in cancer treatment. Camptothecin

Catharanthus roseus

(CPT), a monoterpene indol alkaloid, is regarded as one of the most promising anti-cancer drugs of the 21st century. Camptothecin has not been synthesized so far, therefore its production depends entirely on natural sources. Ghanera contains significantly high amount of CPT, hence the plant has gained international recognition. It is being extensively harvested, though it is categorized as a vulnerable and endangered plant.

5. *Camptotheca acuminata* Dence.
Family Nyssaceae.
Common name: Happy Tree, Cancer Tree, or Tree of Life.
Medium sized deciduous tree, growing up to 20 m tall, native of southern China and Tibet. Leaves big, oval-shaped, light green in colour. Flowers white to yellowish in spherical clusters. Bark, tender leaves, root, and fruit contain the alkaloid camptothecin. Irinotecan and topotecan are structurally related semi-synthetic derivatives of natural camptothecin. Topotecan is used to treat ovarian cancer, small cell lung cancer, and acute myelogenous leukaemia. This tree contains pentacyclic quinolines, camptothecin, and 10-hydroxy camptothecin, which inhibits DNA.

Topo-isomerase is very effective against cancer cells. Decoctions of the root, bark, and fruit can be used to treat gastric cancer, esophageal cancer, carcinoma of the bladder, and other kinds of cancer.

In addition to the plants mentioned above, there are a few more species which also have potential as medicines in the treatment of cancer. Some of

Sinopodophyllum hexandrum

Ophiorrhiza rugosa

these plants are listed below, on which more detailed research may prove fruitful. If success is achieved in reducing the cost of the treatment, minimizing painful suffering, and of course side-effects, that will be a great achievement in the treatment of cancer.

1. Tinospora sinensis (Lour.) Merr. Family Menispermaceae. Local name: Gulvel, Guduchi, Charkrika.
2. Curcuma longa Linn. Family Zingiberaceae. Local name: Halad, Haldi, Turmeric.
3. Semecarpus anacardium L.F. Family Anacardiaceae. Local name: Bibba, Bilva, Marking Nut.
4. Withania somnifera (L.) Dunal. Family Solanaceae. Local name: Ashvagandha.
5. Cannabis sativa Linn. Family Cannabinaceae. Local name: Bhang.
6. Ophiorrhiza rugosa Wall. Family Rubiaceae.
7. Miquelia dentata Family Icacinaceae.

Note: *Photographs courtesy the Author.*

Every Flower is a Soul Blossoming in Nature

Text & Photographs: Somnath Pal

Water lilies are associated with enlightenment in Buddhism

Water lilies are perennial, aquatic, diurnal and nocturnal flowering plants mostly found in wetlands in the temperate and tropical regions of the world. The scientific name *Nymphaea* is derived from the Greek nymph, meaning young bride, and in Greek mythology, nymphs were feminine spirits that inhabited waterways and springs. Today there are many new varieties of water lilies which have been created by crossbreeding, with astonishing colours and many petals, and beautifully moulded leaves called lily pads. Water lilies are referenced in many cultures, and are associated with rebirth and optimism, as they come back into bloom in waterways after the rains, even if they had dried up the previous season.

Water lilies also symbolize fertility, sexuality, and creation. White water lilies symbolize peace, purity, pleasure, and spiritual enlightenment. The symbolism can be traced back to antiquity and plays a significant role in various cultures across the globe. From beauty to enlightenment, these beautiful flowers represent emotions and ideas. The symbolism varies in different cultures and ceremonial practices around the world.

CULTURAL REFERENCES

The water lily is the national flower of Bangladesh. It symbolizes love and life, and is used in almost every religious ceremony. In ancient Egypt, this flower depicted unity among the people. The lily, a symbol of Upper Egypt, was featured with the papyrus flower, which was symbolic of Lower Egypt; thus the combined symbol was used to denote a united country. Ancient Egyptians had high regard for the blue water lily, which they used to represent the sun, and as a symbol of rebirth, from the daily opening and closing habit of the flower. In Asia, the water lily has a completely different symbolic meaning. Since it produces blossoms and fruit simultaneously, it represents universality. It is considered sacred by Buddhists and Hindus. According to Buddhism, water lilies are associated with enlightenment. Water lilies of different colours have different meanings, according to the ancient Buddhists, and these beliefs are held to this day.

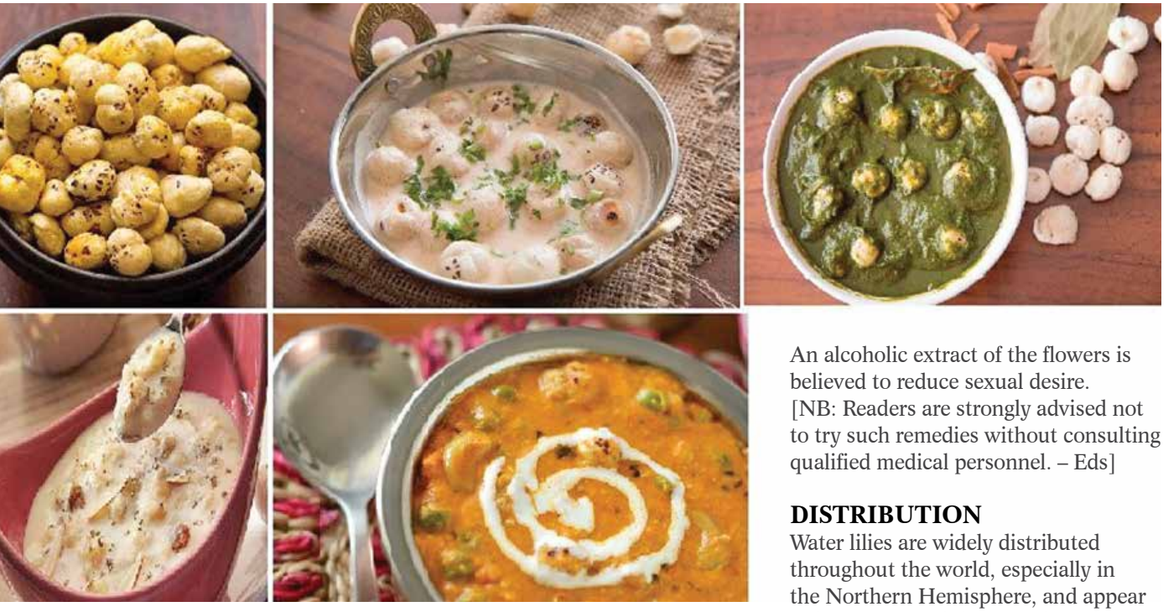
In the spiritual arena of Hinduism, the concept of resurrection is symbolized by the water lily, it closes its blossoms at night (or during darkness), and opens with the first rays of the sun. It is also a symbol of purity, because even though the plant grows in mud, the emergent flower is pure and free from blemishes.

SOURCE OF FOOD

Besides their cultural significance, the Nymphaeales provide an important source of food and economic products. The stout tubers of the water lily and the lotus are edible when cooked, and are an important source of starch both in Asia and North America. The seeds of many species have a fleshy outer covering which is also edible. In addition, the tubers have been used as a source of dye and for their medicinal effects, ranging from traditional use as an aphrodisiac to recent use in cancer treatment.

The seeds of the species *Euryale ferox*, called *makhana*, are a super food crop, cultivated mainly in Bihar and Assam in India. They are used to create a variety of dishes and as seasoning.

Water lilies symbolize fertility, sexuality, and creation.



Makhanas are used in roasted snacks, curries, and kheer (a heavy porridge with milk).

Also called fox nuts, gorgon nuts, or phool makhana, they are loaded with nutrients and have many health benefits. They are enriched with proteins, carbohydrates, and minerals like potassium, phosphorus, magnesium, iron, and zinc. Makhana has astringent properties, fibre, and antioxidants, with low calorie value but good nutritional content.

DECORATIVE USES

Water lilies produce beautiful flowers and large lily pads, a wonderful sight on ponds and lakes. As they grow in water, they can be used to decorate freshwater ponds. They survive in a variety of temperatures, and the plant is not only decorative but also provides shade for underwater creatures, and a pleasant fragrance. In Thailand, it is a popular practice to dry the flowers and store them for decorative purposes. Lotuses are also quite popular for decoration and there are many types of lotus which can survive for up to two weeks in vases. Water lilies are highly valued today mainly on account of their decorative qualities, and the fact that they may be grown in ponds or other aquatic habitats, where few other ornamental plants will grow.

MEDICINAL BENEFITS

The rhizome (root) of water lily is antiseptic and astringent. In traditional medicine, it is used to treat kidney pain, congestion, and as a gargle to treat sore throat. The rhizome also help alleviates pain and has sedative properties. It is important to collect the rhizome in the fall; it can be dried and stored for later use. A decoction prepared from water lily flowers and administered as a uterine injection has been reported as a cure for uterine cancer. An alcoholic extract of the flowers is believed to reduce sexual desire. [NB: Readers are strongly advised not to try such remedies without consulting qualified medical personnel. – Eds]

DISTRIBUTION

Water lilies are widely distributed throughout the world, especially in the Northern Hemisphere, and appear to have attracted the attention of humankind in many countries from the earliest times. Numerous references to these flowers in classical literature are evidence of the early interest they aroused in Mediterranean countries, in Egypt and North Africa, in Asia, the Americas and worldwide, except in cold and hot deserts and arid regions. They do not grow in salt water.

CONSERVATION AND PROPAGATION

Some varieties of water lily which are found in India and the neighbouring countries are of prime importance, and it is necessary to preserve and propagate them, and to keep their wild habitats safe. The species *Nymphaea nouchali* has many variants found in many parts of India; it is also the national flower of Bangladesh and Sri Lanka, the colour ranges from blue, through pale blue to white, and occasionally even pink, the leaves are mostly round and parrot green above and dark maroon to purple below. This wonderful species has many useful properties.

Seasonal ponds are a common sight in many parts of India, and across the

Breeders work to create hybrids with the best colour, fragrance, and shape.

world where dry lowlands become filled with rain water during the monsoon, bringing new life to the dead land. Many water lilies which die back in summer, come alive in such seasonal ponds in the rainy season, sprout leaves and flowers, a beautiful sight. These water lilies are well adapted to the change in water levels in such wetlands. After the rainy season is over, when the water starts to dry up, these plants quickly grow tubers (underground stem), become dormant, and survive in the dry soil for almost 4–6 months. The land looks like a desert, with nothing visible on top, and dry but living bulbs stored beneath the soil surface, waiting for the next rainy season to arrive. They are so well adapted to ecological changes, and their capacity for survival so strong, that in such a short season they sprout, grow leaves, spread like giants and flower abundantly. And then they develop seed pods which in turn produce many seedlings which, before the end of the monsoon develop small bulbs to survive the dry season. This survival instinct is seen in many water lily species. In fact, through their journey of starvation, reduced rainfall, the long dry summer, water lilies seem to have adapted to the fullest to ensure they do not get extinct.

THREATS TO SURVIVAL

But growing human habitations, over-exploitation of natural ponds, and spreading manmade constructions pose a great threat to these lilies, like all native species. It is difficult to preserve pure wild strains, since breeders cannot completely prevent crossbreeding with other species when there are two or more types of lilies growing close to each other in a constricted space. Also, native species are best suited to the local climate from where they are collected, that is where they are well adapted over many decades and can grow at their best.

CHARACTERISTICS OF WATER LILIES

When we look at water lilies, the first thing we see is their beauty and colour, but if you decide to keep a water lily with you what else will you observe? Their smell, flower opening time? When does the flower close, how long does it remain open? Now, you can sum up these characteristics in a plant and imagine how it would be. When we mix a set of characteristics between two different native plants, what we get is a mix of both parents, a hybrid. The work of breeder is to bring more defined characteristics, flower shape, colour, fragrance, beautifully moulded leaves, compact growth habit, easy to grow characteristics and so on.

MORE ABOUT WATER LILIES

Water lilies are both day blooming and night blooming, though there are many subgenera within the family. Tropical water lilies could be either day bloomers or night bloomers. Hardy species are always day bloomers. Tropical day bloomers are treated as perennial in tropical climate, and where the winter is mild; if tropical water lilies have to grow in a cooler climate or where the winter is severe, the plant and tuber has to be brought inside a greenhouse or else stored inside in peat moss or in a warm space, hence they are referred as tropical for their suitability to tropical climates.

GROWING WATER LILIES

This is very easy, but there are some basic requirements.

1) **Sunlight:** More than three to four hours of direct sunlight is sufficient to grow water lilies, any more than this is better and beneficial.
2) **Water:** Water lilies cannot survive without water and we should always ensure that plant is never allowed to dry as this could kill the plant and the tuber. We need to keep refilling the pot with water in case of evaporation.
3) **Cleanliness:** I have never mentioned this point before, but I feel this is an important reason why some plants do better than others. We should keep the aquaculture clean and hygienic, free of pests and filth.
4) **Soil:** Soil is the most important factor after sunlight, since many people complain that their water lilies are not growing properly or have become infested with pests. It is important to have sufficient nutrients for steady growth. Soil that may work for terrestrial plants may not work for aquatic plants, since most terrestrial plants love soil with more organic content, light soil where roots can grow easily and with good drainage. Aquatic plants need the very opposite. They like soil that is heavy and holds moisture, nutrients, and provides anchor for the roots. They like fermented manure. Cow manure may seem like it is working but it tends to produce too much heat and if unfermented, the process of fermenting harms the plant. Clay soil seems the best choice since it has all the qualities required for water plants. In case of doubt you can always get your soil tested to know how much goodness it holds.

HYBRIDIZING LILIES: MY JOURNEY

My first encounter with water lilies was at age 16 when I visited a nursery to buy some plants and came across water lilies. I was amused to see how the beautiful floating lily pads and buds appear above the water. Since then the only thing which comes in my mind is to collect as many water lilies as I can and

Water lilies are found in numerous varieties from white to blue to deep pink.

I have never had a mind to grow anything else. I love to go to a natural pond and collect a tuber, or to buy a beautiful water lily from an online platform. Gradually I dedicated more time to them and decided to breed water lilies.

My first registered water lily is Nymphaea Fortune Teller which I registered in the year 2016. The next year, 2017, I registered five more water lilies with the International Waterlily & Gardening Society. The names of the hybrids are Arryan, Swayam, Rishi, Riya, and Gaurav. 2018 was a bit of struggle since I was looking for more space and was finally able to find it. Today I am a hobbyist, a collector, hybridizer, and a small seller. I hold more than 120 varieties of water lilies and have more than 50 types of lotus growing in my farm. That makes me happy indeed.

Note: *Condensed from the talk by Shri Somnath Pal, Lily Culturist*

BEST WISHES

TO

NATIONAL SOCIETY OF THE FRIENDS OF THE TREES

FROM

MEMBERS OF FRANGIPANI GARDEN GROUP MUMBAI

IT IS A GROUP OF LIKE MINDED PEOPLE WHO SHARE THE JOYS OF GARDENING

MEMBERS TRY TO FULFILL SOCIAL OBLIGATIONS TOWARDS ENVIRONMENT PROTECTION, GREENERY AND CLEANER SURROUNDINGS BY WAY OF MEETINGS ON TERRACE GARDENING OR SMALL FARM MANAGEMENT AND GARDEN CRAFT/HEALTHY COOKING.

FRANGIPANI OR TEMPLE TREE IS IDENTIFIED WITH PSYCHOLOGICAL

PERFECTION ON THE WAY TO FULFILLMENT.

ITS FLOWER HAS FIVE PETALS AND SIGNIFIES FIVE ELEMENTS AND FIVE SENSES. WE AT FRANGIPANI GARDEN GROUP STRIVE TO LIVE LIFE IN HARMONY AND PEACE AMIDST GREENERY.

JYOTI & NIKUNJ PAREKH

Flowering Spurges in the Sagar University Botanic Garden

Text & Photographs: Pankaj Kumar Sahu

Spurges belong to the Order Malpighiales, one of the largest orders of flowering plants, with about 16,000 species, comprising about 7.8% of the eudicots.[1] Malpighiales are divided into 32–42 families, depending upon which clades in the order are given the taxonomic status of family.[2] In the APG III system, 35 families are recognized. Medusagynaceae, Quiinaceae, Peraceae, Malesherbiaceae, Turneraceae, Samydaceae, and Scyphostegiaceae are consolidated into other families.[3] Among flowering plants, Euphorbiaceae is the fifth largest family, comprising c. 6,300 species and c. 245 genera distributed primarily in the tropics.[4] Euphorbiaceae is divided into three subfamilies, i.e. Acalyphoideae, Crotonoideae, and Euphorbioideae.

In some tropical countries, botanical gardens have been created alongside national parks, and are designed to play a role in integrated conservation, sustainable development, and public education.[5] There are approximately 1,846 botanical gardens across 148 countries worldwide.[6]

Milky latex is characteristic of the subfamilies Euphorbioideae and Crotonoideae. This latex is poisonous in the Euphorbioideae, but innocuous in the Crotonoideae. The latex of spurges has been used as a laxative.

CHARACTERISTICS OF SPURGES

Spurges are generally distinguished by the milky sap contained in the tissues of many of its species. Some members of this family are useful as sources of oil or wax. Euphorbids are monoecious or dioecious, with radially symmetrical unisexual flowers. The male and female flowers are usually borne on the same plant. Leaves are alternate, simple, entire, or sometimes compound and deeply palmate-lobed (as in *Ricinus* and *Jatropha*) with stipules. The stipules may be reduced or hairy, glandular as in *Jatropha* or spiny in *Euphorbia*, or sometimes absent (in succulent species). Stamens number 1 to 10 or more. Female flowers are hypogynous, with ovary superior, tricarpellary, trilocular, and with axile placentation. The flowers of *Euphorbia* are typically unisexual, borne in clusters (cyathia). The present work was done in the University Botanic Garden of Sagar, to study angiosperm diversity, particularly on spurges. The collected plant samples were identified with the help of Flora of Madhya Pradesh[7–9], Manual of Cultivated Plants and Literature[10] and other literature. Among the spurges identified in the Botanic Garden, 24 are described below.

TAXONOMIC DESCRIPTIONS

1. *Acalypha godseffiana* Mart.
Medium-sized to tall shrub, often grown as an ornamental plant. Leaves simple, alternate, ovate, wavy or toothed, bright green with creamy white margin. Stem woody, brown. Inflorescences inconspicuous, pinkish green, in axillary spikes; Flowers reddish or whitish green, male spikes generally with more flowers, female spikes with less flowers borne in a bract. Fruit a capsule.
Flowering & Fruiting: Not observed.

2. *Acalypha hispida* Burm.f.
A much-branched shrub. Leaves broadly ovate, acute or acuminate, rounded at base; petiole long, veins of leaf coarsely toothed. Inflorescence solitary axillary, spicate, shortly pedunculate, spike larger than *Acalypha wilkesiana*. Fruit a capsule.
Flowering & Fruiting: December–February.

3. *Acalypha indica* L.
Annual, erect herb. Leaves ovate, rhomboid-ovate, crenate-serrate. Flowers in many lax, erect, elongated axillary spikes, male spike minute, in clusters, female flowers scattered, surrounded by large, dentate, wedge shaped bracts. Capsules small, hispid.
Flowering & Fruiting: December–April.

4. *Acalypha wilkesiana* Muell.-Arg.
Erect shrub. Leaves large, broad, cordate, acuminate, crenate or coarsely serrate, variously mottled. Spikes red and purple, slender in drooping festoons. Flowers small, bright red.
Flowering & Fruiting: January–May.

5. *Chrozophora rottleri* (Geiseler) A. Juss. ex Spreng.
Erect habit. Leaves triangular, length and breadth almost the same, larger leaves light green, surface uneven above but not folded, base usually symmetrical. Inflorescence with basal red female flowers; male flowers apical, yellow, longer than leaf at least in fruit. Fruit rough with flat stellate hairs, covered with scales.
Flowering & Fruiting: February–April.

6. *Codiaeum variegatum* (L.) Rumph. ex A. Juss.
Much-branched evergreen shrub, twigs pale brownish grey. Leaves variable, ovate-lanceolate to linear, obtuse to acute, rounded-cuneate to attenuate, glabrous, shiny, marked with white, yellow, or red, leathery, pinnately veined, stipules minute or absent. Bract minute in male inflorescence. Male flowers with sepals sub-orbicular, concave, glabrous, greenish or yellowish-white, petals 5–6, bilobate; stamens many, white; anthers yellow. Female flowers longer than male, connate at base, style 3, ovary ovate. Fruit a smooth trilobed or sub-globose capsule.
Flowering & Fruiting: April–August.

7. *Croton bonplandianus* Baill.
Much-branched woody herb, branches moderately stellate-hairy to subglabrous. Leaves alternate-sub-opposite; petiole slender, sparsely to densely stellate-hairy; leaf blade narrowly ovate-lanceolate. Inflorescence terminal, sparsely stellate-hairy to sub-glabrous. Flowers laxly distributed. Male flowers pedicellate, slender, glabrous, petals short, white, stamens 12. Female flowers at the base, sepals lanceolate, ovary ellipsoid, hairy. Fruit a sparsely stellate-hairy pale brown capsule; seeds ellipsoid, grey, minute.
Flowering & Fruiting: April–September.

8. *Euphorbia hirta* L.
Erect or decumbent herb, stems with yellowish hairs. Leaves alternate, unequal sided, elliptic-oblong, obovate or oblong-lanceolate, tip acute, base narrow-obliquely cordate. Cyathia minute, hairy in crown, axillary cymes, red-tipped gland, with or without a limb, lobes ovate-triangular, ciliolate; perianth absent. Male flower with pedicellate stamen; female flower solitary pedicellate, 3-celled, 3-ovuled, 3 style, bifid. Capsules globose, hairy.
Flower & Fruiting: Almost throughout the year.

9. *Euphorbia heterophylla* L.
Annual, erect herb. Stem angular ribbed, with scattered hairs. Leaves ovate, elliptic-rhomboid, red spotted at base, entire or slightly toothed margins. Flowers arranged in cyathia, containing 3–5 male flowers, reduced to 1 stamen; one female flower reduced to one ovary. Capsule hairless, trilobed, seeds warty, brown or grey mottled.
Flowering & Fruiting: August–October

Euphorbia heterophylla

Euphorbia milii, red flowers

10. *Euphorbia lactea* Haw.
Cactus-like erect shrub, branches 3–4 angled or rhombic, ridges spiny. Leaves minute, deciduous; stem with poisonous milky sap.
Flowering & Fruiting: Rarely flowers.

11. *Euphorbia leucocephala* Benth.
Erect shrub with pinkish stem. Leaves narrow, ovate, oblanceolate, underside light green. Bracts obovate, creamy white in group. Flowers fragrant, greenish white or yellow.
Flowering & Fruiting: December–March.

12. *Euphorbia milii* Des Moulins
Succulent climbing shrub, stem densely spiny, straight, slender. Leaves obovate. Flowers small, subtended by a pair of conspicuous petal-like bracts, variably red, pink, or white, sap moderately poisonous.
Flowering & Fruiting: April–August.

13. *Euphorbia pulcherrima* Willd. ex Klotz.
Shrub. Leaves dark green ovate dentate. Flowers tiny, yellow with leaf-like bright red bracts, most often flaming red but can be orange, pale green, cream, pink, white, or marbled; bracts often mistaken for flower petals because of their grouping and colours.
Flowering & Fruiting: April–August.

Euphorbia milii, white flowers

Euphorbia pulcherrima

14. *Euphorbia tirucalli* L.
Branched, small tree. Branchlets cylindrical, green, whorled or fascicled with white latex. Leaves small linear-oblong; involucres clustered in branched fork, shortly pedicellate. Male florets bracteolate, laciniate at tip. Style short, recurved, bilobed. Capsule globose, compressed, velvety; seeds ovoid.
Flowering & Fruiting: January–March.

15. *Euphorbia thymifolia* L.
Prostrate herb with hairy stems. Leaves oblong or elliptic, appear hairy, serrulate, mucronate at apex, obliquely rounded at base. Cyathia solitary or cyme, hairy, gland minute, shortly stipitate. Schizocarp appressed-hairy throughout.
Flowering and Fruiting: January–November.

16. *Euphorbia tithymaloides* L.
Glabrous, succulent shrub. Stem erect, green. Leaves elliptic or sub-orbicular, fleshy, green. Flowers terminal, slipper shaped, red, in dichotomous cyme with caducous bracts; Involucre with bract scarlet, obliquely irregular. Male flowers with hairy pedicel, while the female is glabrous.
Flowering & Fruiting: December–January.

Euphorbia tithymaloides

17. *Euphorbia trigona* Sensu.
Perennial succulent shrub. Stem dark green, V-shaped, mostly trigonous, long thorns in pairs on stem ridge. Flowers white or light yellow.
Flowering & Fruiting: Spring–Summer.

18. *Jatropha curcas* L.
Shrub with branchlets hairy with large leaf-scars. Leaves long petiolate, lobes obtuse or acute. Flowers in glabrous or pubescent cymose panicles, monoecious, in cyme or in fork usually female; sepals 5, nearly free. Petals campanulate, 5-lobed, hairy; stamens 10; ovaries 2–4 celled, glabrous; styles 3, bifid. Fruit in capsules, 2–4 subglobose-ellipsoid, 2-valved cocci, yellow turning black, schizocarp or drupe.
Flowering & Fruiting: May–August, October–December.

19. *Jatropha gossypifolia* L.
Erect shrub, branches tinged with dark purple. Leaves many lobed, petioles with glandular hairs, stipule glandular. Bracts glandular-ciliate. Flowers monoecious, small, red, in terminal, glandular, corymbose cymes. Sepals 5, ovate-acute; petals 5; stamens 10–12, connate; ovaries 3-celled, globose-ellipsoid, styles 3, connate at base. Capsules oblong, trigonous, truncate at both ends.
Flowering & Fruiting: July–September.

20. *Jatropha integerrina* Jacq.
Evergreen woody shrub or small tree. Foliage green, leaves oblong-obovate or three-lobed, simple, alternate. Flowers unisexual, male and female flowers on the same plant, red in colour, usually in clusters. Fruits oval-shaped, green; seeds 0.9–1.0 cm long.
Flowering & Fruiting: Free flowering.

Jatropha integerrina

21. *Jatropha multifida* L.
Small shrub. Leaves deeply divided, lanceolate-acute lobes, palmate-partite. Stipules branched, petioles long. Inflorescence terminal cymes with many flowered branches, red. Flowers pedunculate, monoecious, calyx 5-lobed, petals 5, oblong, red; stamens 8–10, filaments united, disc cup-shaped, glands prominent; ovary on a disc, 3-celled, styles 3, stigmas bifid. Fruits obovate yellow capsules.
Flowering & Fruiting: August–November.

22. *Jatropha podagrica* Hooker
Erect shrub with woody stem, swollen at base with branches stout and short, fleshy, sparsely lenticellate, stipules spiniform. Persistent leaf scar large, prominent; petiole glabrous. Leaves peltate, rotund-elliptic, green adaxially, grey-green abaxially, glabrous on both surfaces, base truncate-obtuse, palmate veins. Inflorescences long, terminal, red. Sepals rotund; Petals red, obovate-oblong. Stamens 6–8, connate at base. Ovary glabrous; styles 3, connate at base, bifid at apex. Capsule ellipsoid, with 3 longitudinal grooves, seeds smooth.
Flowering & Fruiting: Throughout the year.


Jatropha podagrica

23. *Manihot esculenta* Crantz.
Small shrub with fleshy tuberous roots. Leaves deeply lobed, lanceolate, acuminate, hairy. Inflorescence axillary and terminal panicles. Monoecious, bearing male and female flowers on the same plant. Fruit capsule, wing-angled.
Flowering & Fruiting: January–May.

24. *Ricinus communis* L.
Evergreen shrub. Stems fistular, often suffused red, branches glaucous. Leaves alternate, peltate, orbicular, lobes ovate-lanceolate to oblong, caudate-acuminate, serrate; petioles long. Flowers monoecious in terminal or sub-panicled racemes, apetalous, creamy white or yellowish green. Male flowers at base, much branched, perianth membranous, lobes 3, ovate-lanceolate, disc absent, stamens many. Female flowers at apex, perianth caducous, lobes 5, styles 3, bifid, bipartite, arms papillose; stigma red. Fruit capsule globose-oblong, green, often tinged with red, 2-valved cocci.
Flowering & Fruiting: September–June.

DISCUSSION

The Botanic Garden of Sagar University is considered to be one of the richest gardens in Madhya Pradesh and central India, as it supports ex situ conservation of angiosperms, gymnosperms, and some rare pteridophytes. In the present study, it was revealed that in the Sagar University Botanic Garden, family Euphorbiaceae is represented by 8 genera and 24 species, of which *Euphorbia*, *Jatropha*, and *Acalypha* were recorded as the most dominant genera. These genera are distributed in almost all the parts of the Botanic Garden, due to their high adaptability to varied ecological conditions.

The most dominant genus was reported to be *Euphorbia* with 10 species, followed by *Jatropha* with five species (Table 1). Most of the species of *Acalypha* grow well in full sunlight and have been planted in the Botanic Garden for ornamental purposes and as hedges. A few varieties of *Acalypha* (except *Acalypha indica*) are grown in pots and are highly popular as ornamentals.

Poinsettia is one of the most beautiful shrubs, and is planted as an ornamental in gardens and parks for its beautiful bright red flower-like bracts. It is grown in the ground and in pots. Ornamental poinsettias are hardy and quick growing, favouring sunny locations, and can be induced to flower by shortening the day length.

Table 1 Diversity and status of Spurges in the University Botanic Garden, Sagar

S. No.	Botanical Name	Common Name	Habit	Wild/ Cultivated	Distribution
1	*Acalypha godseffiana Mart.*	Fire Dragon	Shrub	Cultivated	New Guiana
2	*Acalypha indica* L.	Kuppi	Herb	Wild	Throughout the Tropics
3	*Acalypha hispida* Burm.f.	Cat's Tail	Shrub	Cultivated	East Indies
4	*Acalypha wilkesiana* Müll. Arg.	Copper Leaf	Shrub	Cultivated	Fiji Islands
5	*Chrozophora rottleri* (Geisel.) Juss. ex Spreng	Rottler's Chrozophora	Herb	Wild	India, Andaman Islands, Myanmar
6	*Codiaeum variegatum* (L.) Rumph. ex A. Juss.	Variegated Croton	Shrub	Cultivated	Indonesia, Malaysia, Australia
7	*Croton bonplandianus* Baill.	Croton	Herb	Wild	S. Bolivia to Uruguay
8	*Euphorbia hirta* L.	Dudhi	Herb	Wild	Tropical America, Tropics
9	*Euphorbia heterophylla* L.	Badi dudhi	Herb	Wild	Tropical America
10	*Euphorbia lactea* Haw.	Candelabra Spurge	Shrub	Cultivated	India, Sri Lanka, East Indies
11	*Euphorbia leucocephala* Benth.	White-lace Euphorbia	Shrub	Cultivated	South Mexico, West Indies
12	*Euphorbia milii* Des Moulins	Kiss-me-not	Shrub	Cultivated	Madagascar
13	*Euphorbia pulcherrima* Willd. ex Klotz	Poinsettia	Shrub	Cultivated	Mexico
14	*Euphorbia tirucalli* L.	Pencil cactus	Herb	Wild	India (Malabar)
15	*Euphorbia thymifolia* L.	Small Dudhi	Herb	Wild	Caribbean territory
16	*Euphorbia tithymaloides* L.	Backbone herb	Herb	Cultivated	South America, Brazil, Australia
17	*Euphorbia trigona* Sensu.	African Milk Tree	Shrub	Cultivated	India, Malaya
18	*Jatropha curcas* L.	Biodiesel plant	Shrub	Wild	Mexico, Subtropical America
19	*Jatropha gossypifolia* L.	Black Physic nut	Shrub	Wild	Mexico, South America
20	*Jatropha integerrina* Jacq.	Spicy Jatropha	Shrub	Ornamental	West Cuba
21	*Jatropha multifida* L.	Coral Bush/ Physic nut	Shrub	Ornamental	Tropical America
22	*Jatropha podagrica* Hooker	Buddha belley	Shrub	Cultivated	Tropical America
23	*Manihot esculenta* Crantz.	Cassava	Shrub	Cultivated	S. America
24	*Ricinus communis* L.	Castor	Shrub	Wild	Africa, Tropical & subtropical regions

Universities traditionally maintain botanic gardens which serve multipurpose functions in teaching, research, and conservation, and many are open to the public. BGCI's Plant Search database provides a unique tool for measuring progress towards Target 8 of the Global Strategy for Plant Conservation.[11] Botanic gardens have an important role to play in conserving rare and threatened plants, and ensuring that no species of cactus or other succulent plant becomes needlessly extinct.[12]

The field work indicated that the study area is rich in species diversity and further floristic survey will yield more information and great diversity in species and genera of the Spurge family. Ex situ techniques must be adopted because in situ conservation will not always be sufficient to ensure the long-term survival of rare and medicinal species. The Sagar University Botanic Garden is a fine and outstanding example of ex situ as well as in situ conservation.

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"A botanical garden is a controlled and staffed institution for the maintenance of a living collection of plants under scientific management for purposes of education and research, together with such libraries, herbaria, laboratories, and museums as are essential to its particular undertakings.

Each botanical garden naturally develops its own special fields of interest depending on its personnel, location, extent, available funds, and the terms of its charter.

It may include greenhouses, test grounds, an herbarium, an arboretum, and other departments. It maintains a scientific as well as a plant-growing staff, and publication is one of its major modes of expression."

– Defined by the staff of the Liberty Hyde Bailey Hortorium, Cornell University, 1976

TREES ARE OUR FRIENDS

**"The best time to plant a tree is twenty years ago.
The second best time is now."**

– Chinese proverb

"People who do not sustain trees will soon live in a world that will not sustain people."

– Bryce Nelson

"The symbolism – and the substantive significance – of planting a tree has universal power in every culture and every society on Earth, and it is a way for individual men, women, and children to participate in creating solutions for the environmental crisis."

– Al Gore

WITH COMPLIMENTS FROM

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MUMBAI

Butchart Gardens

from a Wasteland to a Symphony of Colours

Text & Photographs: Shobha Ramana Pakala

Mary Ann Evans, the famous Victorian poet who went by the pen name George Eliot, had said, "It will never rain roses: when we want to have more roses, we must plant more trees." Probably inspired by this, Jennie Butchart commenced the process of turning her husband's limestone quarry into what is famous today as the Butchart Gardens in British Columbia, Canada. Armed with a single rosebush and some sweetpeas presented to her by a friend, Jennie transformed the desolate, worked-out quarry into a brilliant landscape of immaculate flower beds, glorious fountains, stately trees, lush grass, and eye-catching sculptures. Today, the Butchart Gardens cover more than 55 acres and boast of a Sunken Garden, the spectacular Rose Garden, the Japanese Garden, the Italian Garden, and the Mediterranean Garden.

The Butchart Gardens can be enjoyed throughout the year, even during a bleak winter when it serves as an oasis in a desert. The gardens come to life when the earth rejuvenates itself during spring and the terrain brightens with cherry blossom and daffodils. The garden is abuzz with activity during the summer, with live performances on the Concert Lawn and spectacular firework displays at night. Autumn sees a mesmerizing display of copper, bronze, and crimson, as the leaves change colour. No wonder it is called "A Garden for all Seasons."

I was fortunate to get an opportunity to visit the Butchart Gardens on 26th July, 2019 when our cruise liner, the Norwegian Joy docked at Victoria, British Columbia at noon. The minute I stepped out, I realised that I was in for a visual extravaganza. Victoria is a modern, bustling city with old world charm. The Canadian Rockies and the Pacific Ocean add to the beauty of the landscape already filled with a riot of colourful blooms in every window, balcony and open spaces within the city. All lamp posts seemed to be straining under the weight of two large hanging baskets ablaze with vivid begonias, day lilies, impatiens, daisies, lantanas, and fuchsias. As we boarded the shuttle to the Butchart Gardens, our driver who also served as our tour guide began an interesting commentary on the heritage buildings, the majestic trees and the flora and fauna of this very popular tourist destination, which attracts over a million visitors each year. Driving through the city we passed by the cherry trees of China Town; gardens of strawberries, blue berries, and loganberries; apiaries, sheep farms and wineries. The journey seemed almost as interesting as the destination!

The Monkey Puzzle Tree

An aesthetic signboard with the words, "The Butchart Gardens: Over 100 Years in Bloom" welcomed me to the awe-inspiring array of flowers, trees, ponds, and sculptures. The first glance at the gardens simply took my breath away, as a colourful

Top: The Fountain of the Three Sturgeons
Mid: The Japanese Garden
Above: The Dragon Fountain

The Sunken Garden

Begonias at Butchart Garden.

Marigolds in full bloom.

panorama of vibrant hues unfolded before my eyes. Looking at the gardens was like looking through a kaleidoscope with a host of ever changing patterns of healthy blossoms and foliage, attractively arranged in spectacular landscapes. It was difficult to imagine that the mind-blowing Sunken Garden was once a quarry. It now comprises meandering pathways, stone staircases, and striking floral displays. Among the several fountains at the Butchart Gardens, Ross Fountain was the star attraction, with water gushing up to a height of 70 ft. It was installed in 1964 by Ian Ross, a grandson of the Butcharts. Walking through the gardens was a treat for the eyes, with rows upon rows of Michaelmas daisies with their white petals, multicoloured begonias ranging from light pink to magenta and even bright yellow; bunches of mauve hydrangeas, and shining yellow daffodils, to name a few. The charm of the topography was accentuated with delicate milkweed in pink and white as well as bright orange lantanas.

A little gate-like wooden structure in bright red showed the way to the Japanese Garden. Quaint little ponds, charming bridges, patterned pathways, and old-fashioned pagodas were mesmerizing. A stone pathway meandered across a pond under a canopy of trees with colourful foliage. While many of the trees had bright leaves, it was interesting to note the different shades of green in the vegetation. The Japanese Garden captivated me, soothing my nerves as I drank in the tranquil atmosphere. A staircase led from the Japanese Garden to the Star Pond, a

Brilliant colours contrast with dense green foliage.

12-pointed bright green star pattern with clusters of annual flowers in between, testimony to the creative brilliance of the Butchart family. The frog fountain in the centre of the pond added to the appeal.

The garden had numerous stately trees like the Golden Locust tree with brilliant lemon coloured leaves, the larger than life Copper Beech tree, the ghostly Weeping Sequoia and the odd-looking Monkey Puzzle tree amongst many others.

Surrounding a lush green oval lawn was an assemblage of roses in all shapes, sizes and colours. Strategically placed trellises and arches were interwoven with bunches of roses, the fragrance of which was intoxicating. The beautiful Rose

Lantana grows in abundance.

Hanging baskets make a colourful display.

Garden at Butchart will remain etched in my memory for a long time.

One of the newer attractions at the Gardens is a bronze and granite dragon gifted by the People's Republic of China. Incidentally, many Chinese labourers toiled in these gardens in the first half of the 20th century and contributed towards the creation of these picturesque gardens. The Fountain of the three Sturgeons, purchased from Italy in 1973, is another iconic feature of the gardens. The carousel in the Children's Pavilion was inaugurated in 2009, with 30 handcrafted animals like ostriches, zebras, horses, and camels to entertain the tiny tots. I ended my tour at the gift shop which had an array of fetching gift items, all attractively displayed and reasonably priced.

An entire day would be insufficient to get a true feel of the garden. I found myself reluctantly boarding the shuttle that would take me back to the cruise ship. On the drive back to port, the lyrics of Belinda Carlisle's song, "Heaven is a Place on Earth" kept reverberating in my mind after feasting on the breathtaking beauty of Butchart.

A colourful landscape.

promoting international friendship through bonsai

bci

Bonsai Couples

By Sujata Bhat, India

"Excellence endures and sustains. It goes beyond motivation into the realms of inspiration." -Azim Premji

Over the years the world of Bonsai and Viewing Stones has seen many great artists and contributors to this art. However, there are some outstanding 'Bonsai Couples' who have not only achieved excellence but have motivated and inspired several generations of Bonsai artists. They have contributed immensely to spreading the knowledge of Bonsai in their regions and in the world. In fact, one of the founders of Bonsai Clubs International was a couple from USA, Connie and Horace Hinds. BCI acknowledges and is grateful to the following couples who have made a difference in the world of Bonsai.

1) Mr. Horace & Mrs. Connie Hinds, USA
2) Mr. Daizo & Mrs. Naemi Iwasaki, Japan
3) Mr. Chase & Mrs. Solita Rosade, USA
4) Mr. I. C. & Mrs. Helen Su, Taiwan
5) Mr. Malcolm & Mrs. Kath Hughes, U.K.
6) Mr. Willie & Mrs. Gudrun Benz, Germany
7) Mr. Lindsay Mrs. Glenis Bebb, Australia
8) Mr. Nikunj & Mrs. Jyoti Parekh, India

On Seeking The Tree Within

Sumedha Raikar Mhatre

Ms Sumedha Raikar Mhatre with Dr Pheroza Godrej and Dr Saraswathy Unnithan at the release of *Vanashobha*

I am very proud and very privileged to be part of this august gathering and to be here on the occasion of the release of *Vanashobha*, the journal of the National Society of the Friends of the Trees. I would say that I have been in journalism for about 25 years, and I know how many hands go into the making of a magazine. It is a complete team effort, and so I want to give a big hand to those who made this tradition possible for 58 years. Thank you each one, because this is exactly the charm of being in a city of uncertainties. A city where you don't even know if you're going to reach home properly or not; a city where you don't know if the milk supply will be okay tomorrow or what price you will have to pay for your onions. To bring out a magazine of this kind is a pure labour of love. I have a very deep abiding respect for people who bring out these kinds of non profit magazines.

Coming here was a full circle moment and I have just narrated that I had done a piece on a banyan tree that was hacked down on the Sitala Devi temple road where I live. I felt like it was the loss that one feels after losing one's parents. It was that kind of loss. And whenever I thought of the tree, I thought of legacy and roots and those kinds of things. In general I have always wondered about trees in the city, as to who waters them, what keeps them alive, especially those on the road dividers, and the trees at those sooty traffic junctions – at Dharavi, you see a beautiful tree suddenly erupting from nowhere and in the background is the Mithi river and in the foreground you have lots of traffic, and then you have these beautiful trees coming up there. It makes you wonder about the resilience of the city and trees in that sense, always a matter of wonder for me.

And coming here was like a validation of all those feelings. In my personal space I've always thought that when you move out of the city, you go to any place of green, any place of green earth. That when I go out somewhere, I find that it refreshes me for city life. It gives me so much energy that I could take on all the odds that are stacked against me in my life. I feel comfortable coming back and getting the energy that I had lacked at some point. We all go through such phases, we all have our bad moments and bad days. And somewhere trees give me a source of sustenance. Today I'm going to talk about exactly that – seeking the tree within. We all see trees everywhere, there are trees in this campus as well, but there is a tree somewhere inside all of us. We can call it anything, some people call it a soul, some people call it an oasis. Your definition will be different, mine will be different. Ultimately, it is that sustenance that we are all looking at and I am going to go through some ways in which I have kept that tree alive. I hope that this is interesting because sometimes the tree within is as important as the tree outside.

Born in Gwalior, when Gwalior was quite green at that time, and raised in places like Port Blair and Shillong, Roing and Itanagar, and later settling down in Mumbai, what I thought I was lucky about was circumstance. Sometimes there is exposure of India, that is the various Indias within India, and that exposure helps you understand life. I thought that the wilderness helped somewhere with that, in getting that understanding. Then I happened to be in central schools, which again had the united colours of India! So it helped me to understand life and its various images. Then I happened to be part of an iconic play of a women's group here in Mumbai, it was quite a hit in the 1980s and 90s, which was later translated in Hindi, that went to several places all over Maharashtra and later India; that again helped me. When I was asked to cover a scandal for my publication, what was different was not the crime statistics that anybody would have given. My story was appreciated because it has the social dynamics, it had a relation with the actual families which were affected, a chat with the girls, that entire tutorial class phenomenon in our middle town India. What were the aspirations of these girls in the 90s when things were just opening up for us. Television had just arrived, the economy had just opened up, and you found these girls trapped in a scandal which they could have easily avoided. Looking back almost 20 years from now, I feel that what was appreciated in those reports was my being on the spot for 10 days, my relations with those people. Some of them happened to be friends of my relatives, some of them were well-wishers, some were extended family, who helped me to get into that actual story instead of just a touch-and-go report. I feel that understanding India through its countryside by being around is very important.

And coming to all those various reports that I have made in my life to understand and get a feel of the country. There are some things that you are born with – like I was born with three languages, I was born with parents who are now to be part of a travelling play at the age of 50. But some things you achieve, that you cultivate. I remember that the arts were a good introduction. Any kind of art – it could be music for you, it could be dance for him, it could be folk theatre for her, but in my case, it was performing arts and that was theatre. I found it the greenest possible way to connect with Mumbai and then with India. I tell you, if you are interested in theatre, you're interested in so many things because theatre has music, it has dance, it has the visual component, it has architecture, it has sound, it has the spoken word, it has light and dark, it has the costume call, it is a composite form of art. And it introduces you to life in its various forms.

I remember the first play I saw when we came back to Mumbai, and after many years, I took my son for it and it was like completing an arc. The play speaks about hard work as a means to life. And the story of a pampered princess who ultimately realizes the sparkle and charm of hard work. If that play was not presented to me at the age of 15, I would have been a different person. If I had not seen it at that early age, I would have been a different person. Because theatre introduces you to these various elements, there are very many theatre crazy people around you. I have met theatre people who have sold their jewellery, sold their flats, who have eloped, who have attacked each other, who have had severe fights, all in a bid to

present a piece of live action. That I thought was so special and so charming – that is the tree within.

Theatre introduced me to interesting people who nurtured the tree within. You must have heard the name Vijay Tendulkar – I was just an entrant, but I remember him even more so because I had seen some of his plays when I was not even a journalist. And I asked him a question, and today when I am 50, I feel what a stupid question to ask – but that was an innocent question. "Why don't you write enough these days?" And he said, "You know, it is a different India. It is a different world altogether. Today if I were to write Kamala, it would be a different play." Why? Because that whole trafficking problem is over? No, the human flesh problem is still there. But it has different ramifications. People's response to it is different, the social fabric is different. I remember talking to Dr Ashok Ranade, you may have heard the name, he is associated with the NCPA. He had held a workshop on how to retain your own creativity, somewhat like what I am talking about today, how to retain the tree inside. And the talk was about the ways in which you can experience anything. He showed us a blackboard, and I had taken my son again for that, so we were all students in that workshop, and he said – describe the blackboard. So, everybody said it was black, some said something else. So he said, "Why are you describing it in singular terms? Why don't you say it is rough? Because you don't want to touch it. If chalk is put on it, it will create a sound that you will not like. Why don't you want to describe it in those terms? Did I ask you the colour of the blackboard? I said describe the blackboard. You're using only one sense to do that. This is what we're doing in our own lives," he said. "We're limiting ourselves. For any cause that we can give ourselves to, we're limiting ourselves. We have so much to give but we do not necessarily offer ourselves in full heart." Those were his words. …

We splurge a lot as a nation. Diwali time, Ganapati time... we don't have money? Sorry. We have a lot of money. We don't want to seek the tree within. Bird music? Well, it is low on our priority list. Dr Ranade, when he died, I did a bit on him in *Mumbai Mirror*, I still remember his words. I remember the Chetan Dattas, the Manoj Shahs, the Naseeruddin Shahs, the Sitanshu Yashaschandras, and the Dhiruben Patels of the world who have given me something everytime they have spoken to me.

I remember asking Prabhakar Pendharkar how he played six characters in the play "Toh mi Navech" in a span of three hours till the age of 76. He died when he was 80, and only shortly before that he had stopped doing this play. "Toh mi Navech" was like his life, and he said, "Well, energy? Energy just comes because you're interested." That was the tree within him. That was his tree for which he never needed any capsules. He never needed any anti-depressants. It was enough. Similarly, in theatre I would like to quote one person who has given me a lot to water the tree within. You may know his name, a wacky, whimsical individual but people loved him despite his moods. He threw paperweights at people and people still picked them up and said, "Hello Mr Dubey." Satyadev Dubey. I have had umpteen chats with him on why theatre is not selling in India, everybody likes theatre, everybody likes live action, but why don't people invest in it? Why? Because there is a certain cultural history. Our psyche is made that way. Something that is accessible, something that is low stakes, we don't want to invest in that. Like bird music. Why? What will we get out of it if birds are singing? So similarly, about theatre. There was one thing about him, he was never devoid of hope. He died at about 76, never devoid of hope. He did not have a penny, but he was never devoid of hope. I remember he said that don't ever worry about the space that you get. And he was talking in the context of theatre, but I was taking it for my own self. People were talking about Ekta Kapoor at that time. And they were saying, "Oh this television, look at those chudails and nagins and look how they're flourishing." So he said, "Is that your worry? Let that poor Ekta Kapoor flourish. Whatever she's doing, she's doing it well. If you're capable, you go on television. You don't want to do television, you want to do theatre, then wait for your space. There is space for everybody in this country. But you have to just find it." Those words seemed very idealistic for me at the time when I heard them first. Today when I am 50, I am proud. Dubey is no more, but I'm proud to tell you that space just comes if you have the passion.

The play speaks about hard work as a means to life. And the story of a pampered princess who ultimately realizes the sparkle and charm of hard work.

In 2005, I didn't know there would be a magazine like *TimeOut Mumbai* which would call me and say, why don't you do a column for us? I am ever indebted to Naresh Fernandez for the column he gave me. I wrote about a play on people who had mounted it in the dark, because that was their device to talk about the electricity crisis. These people had come from afar, had stayed in some ramshackle hall, and presented their piece at Mumbai Marathi Rangmanch, because they wanted the powers that be to watch it. People who came were theatre people. No government people came for that. But that was enough for them. Because we were the people who were going to reach it to Mantralaya. And they said they were so happy because of the piece that I had done in *TimeOut* about a play in which they are saying, "Yes we are farmers, yes we are stealing electricity, but we don't want to do it. Solve our crisis, we wouldn't want to do it. We don't want to steal, we don't want to be thieves, but you are compelling us to do that." That play made such a resounding impact on all of us because when electricity breaks down, urban people can't even live for 5 to 10 minutes. Here they were mounting a play of one hour in the darkness. They were making a point. So, the point is that space comes if you really work towards it. Space came for them and for me in *TimeOut Mumbai*, space came in *Mumbai Mirror*. I'm specifically taking the name of Meenal Baghel. At one point someone asked me, is she Maharashtrian? I said no, but she is interested in matters to do with Marathi. You don't have to be Maharashtrian for that, you don't have to speak Marathi, you have to have the heart for that. Similarly, the columns that I do now, if I tell you the subjects, you will find them pretty wacky, but when they appear on paper, you will say oh wow, what a good story. Thanks to Tinaz Nooshian, who is with me and who says yes you can do this.

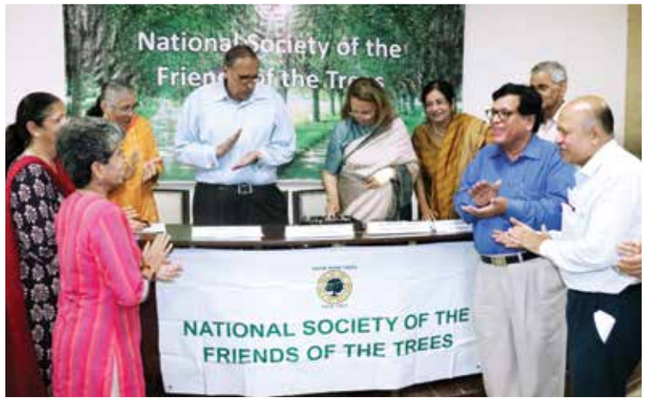
Contributors like us need encouragement. There was a piece I had done on a Warli artist who went to Andhra and taught the tribals and this was a marriage of Warlis and that tribe. It doesn't sound bollywoodish, it doesn't sound glamorous, but it was appreciated by so many. I would like to give the example of another piece that I did on the Wardha Holi. Wardha, we all know what it is known for, and it's no surprise that Wardha has a Holi which is conducted in the crematorium. I had done a piece on that and it was quite a gutsy decision to print that piece, because nowadays when you bust superstitions and you talk about national thinking and all that, you may be called anti-culture. But Tinaz stood by me and I can say that was one of the most entertaining pieces we did. They have actual song, dance, theatre, music inside the crematorium where children and women are encouraged to come because women, unless they are dead, are never encouraged to enter a crematorium. In Hinduism, women cannot enter a crematorium. Here women are called and snacks are served to them so that the fear of death is confronted. Now this piece, as an idea, it comes across as a daring act. It came across as an entertaining as well as daring act and I'm very thankful to my editors for it. Indian media is bashed up a lot, but Indian media has some good editors as well. Those who support contributors and who support language, who support the offbeat, so that the mainstream gets broadened and some other streams get joined. All my journalism has been based on my bilingual and trilingual skill set and thankfully I have editors who have supported those skills.

I will end on the topic of language. We are born with 22 official languages, we are born with 720 dialects. We cannot be anything but proud of this. We have so much going for us. Our journalism can produce hundreds of stories out of this, colourful stories, stories that bind us, not that divide us. This is our material but we have never paid attention to that. There's a lot of talk about saint poetry these days. Why isn't saint poetry helping us then? … It's the same bird music and the oneness with the greenery that Dr Ranade and Dr Satyadev Dubey had wanted to research but couldn't because of the lack of funds. … Can there be a more fertile ground than Maharashtra for everything progressive. Then why are our streets full of violence? Why do we need BNHS and Friends of Trees to remind us that the metro may be important, but the trees are also important. Why is it that we need to be reminded of this? Why aren't languages coming to our rescue? When we see a film like Sairat, is it only a story of two lovers who run away and then get killed later. It's an honour killing story, is it only that? No. It's an introduction to a linguistic culture. Sairat and Fandry are introductions to our nomadic tribes. The Maharashtra that we don't go to, the travel that we don't do, the greenery that we don't see, which are not on our bucket list. I wish that we all have a great bucket list in life. That we all do great in life, we value the greenery, and I hope that we all get the broadest possible scope to understand life in its greenery.

Condensed from the talk given by Ms Sumedha Raikar Mhatre on the occasion of the release of Vanashobha 2018.

Some Landmark Events

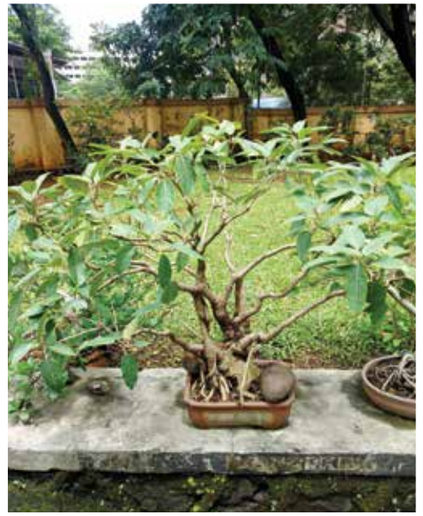
61ST FOUNDATION DAY CELEBRATION,
20th August, 2018



FOT President Dr Ashok Kothari, President Emeritus Dr Pheroza Godrej, Dr Saraswathy Unnithan, Ms Doreen D'sa, Dr Arun Sawant and members join the celebration

At the release of the FOT Journal, *Vanashobha*, Chief Guest Ms Sumedha Raikar with (L-R): Dr Arun Sawant, President Emeritus Dr Pheroza Godrej, President Dr Ashok Kothari, Dr Saraswathy Unnithan

VANASHOBHA 2017-18 RELEASE,
20th August, 2018



Specimen Bonsai displayed at the workshop

BONSAI APPRECIATION WORKSHOP,
2nd September, 2018

A beautiful old Ficus bonsai

VISIT TO VIDYABHUSHAN NURSERY, AUNDH, PUNE,
9th September, 2018

Beautiful lotus at Vidyabhushan Nursery, Aundh

MEMBERS VISIT BUTTERFLY GARDEN AT OWALEKARWADI, THANE,

21st October, 2019

Owalekarwadi is a treat for butterfly lovers

Butterflies are provided a natural environment here

MEMBERS VISIT SUPA FARM AT CHAROTI (DAHANU),

11th November, 2019

Lake created with rainwater collection at Supa Farm

Wild and cultivated plants at Supa Farm, a botanical paradise

FIRST PRIZE WINNERS IN FIVE GROUPS ARE REPRESENTED HERE.

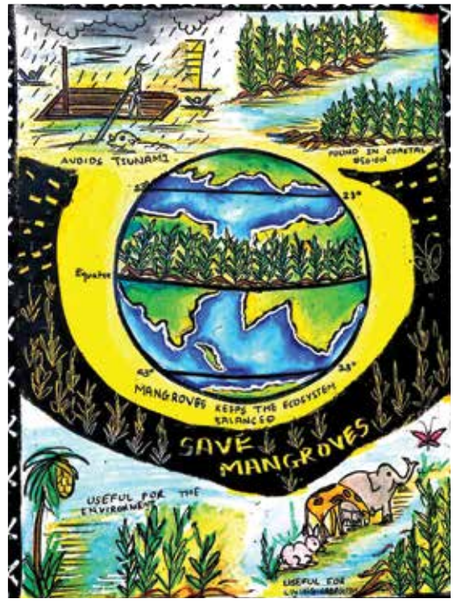
ANNUAL NATURE DRAWING COMPETITION FOR SCHOOL CHILDREN,

1st December, 2018

Group 1, First Prize: Deveshwar

Group 2, First Prize: Sneha Dhara

Group 3, First Prize: Minaad N. Shahh



Group 4, First Prize: Disha Krishna Arane

Group 5, First Prize: Dhairya Paresh Gangar

VISIT TO SAVE NURSERY & AGRO ECOTOURISM CENTRE, GHOLVAD,

15th & 16th December, 2019

Spicy Jatropha

Scarlet Milkweed

Cannonball tree at Ranibaug

FOT MEMBERS VISIT RANIBAUG, BYCULLA,

13th January, 2019

58TH ANNUAL VEGETABLE, FRUIT & FLOWER SHOW,

9th & 10th February, 2019

SPONSORED BY INDUSIND BANK, UPL LTD, GODREJ INDUSTRIES LTD, BAJAJ ELECTRICALS LTD, FDC LTD, DR S. UNNITHAN, AND FRANGIPANI GARDEN GROUP

Dr Meena Haribal making a presentation for Friends of Trees

PRESENTATION ON PLANTS, PEOPLE & CULTURE OF NORTHEAST INDIA,

10th January, 2019

Chief Guest Padma Vibhushan Dr Anil Kakodkar, former Chairman, Atomic Energy Commission, Govt of India being welcomed by President Emeritus Dr Pheroza Godrej and FOT members

Dahlias exhibited at the VFF Show

A colourful display of flowering plants at the Show

Floral rangoli, an ecofriendly celebration

Prize winning bouquets

Vertical gardening, a space saving method

Floral arrangements catch the eye

Floating flower decoration

Bonsai, always a winner

The ever fascinating Bonsai display

Handcrafted bamboo bicycles

Garden entries, a popular section

FOT shining!

NATIONAL SEMINAR ON "CLIMATE, RIVERS & VEGETATION" ORGANIZED BY THE NATIONAL SOCIETY OF THE FRIENDS OF THE TREES, HELD AT ST XAVIER'S COLLEGE, MUMBAI,

14th February, 2019

L-R: Dr Rajendra Shinde, Principal, St Xavier's College, Chief Guest Shri Bittu Sahgal, Dr Pheroza Godrej, Dr Smita Krishnan, and students on the occasion of the Seminar

A rapt audience. Dr Pheroza Godrej, Dr C.S. Lattoo and others at the Seminar

VISIT TO SAGAR UPVAN, COLABA,

24th February, 2019

Colourful berries among the biodiversity at Sagar Upvan

Members were introduced to the plant diversity of the garden

VISIT TO LOTUS & WATER LILY FARM, NADAPURA,

29th June, 2019

SOHRABJI GODREJ VANMAHOTSAVA,

14th July, 2019

Members organize tree planting in memory of the late Shri S.P. Godrej

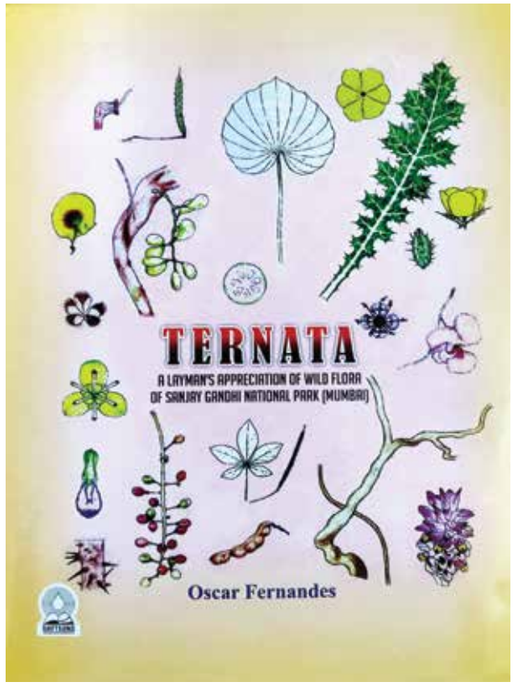
Saplings ready for transplantation

Dummy
Dummy

Text & Photographs: Dummy

BOOK REVIEW

by C.S. Lattoo, PhD



The author was introduced to the plants of Sanjay Gandhi National Park, Mumbai (SGNP) through BNHS visits to the Park from the year 1980. Later on he visited the Park on his own, every Sunday. This he continued till 2017, thus he could make extensive observations in the field and thereafter he did the illustrations. He was able to record plants belonging to 59 families. Some of the species recorded remained unidentified and are listed on the end pages. Why the name TERNATA has been given to the book, the author himself has explained, "There is an impressive line up of species having compound trifoliate leaves, with all sorts of variations, so the Latin word *ternata* (which means in threes)." He also introduces his book as a layman's essay on the subject. He has given his justification for the A4 size of the book, saying that it enabled life-size illustrations.

First of all, I congratulate the author for including *Gnetum*, a rare plant in SGNP, however the exact location is not given. Location for other described plants is also missing. However, in the entire book, the illustrations of plants are appropriate and self explanatory.

The author has followed modern Angiosperm Phylogeny Group IV Classification system which becomes evident by his placing plant *Watakaka* in family Apocynaceae. Quite a few plants do not carry their binomial nomenclature, and in a few places only family name or genus name are mentioned. On page 87, *Entada* flowers along with a drawing have been shown as papilionaceous, and with pod as well, which is incorrect. On page 211, *Alangium*, which belongs to family Cornaceae, is wrongly placed under Umbelliferae. The book ends with a glossary of botanical names and index.

To conclude, I would rather call this book as an appreciation of wild plants of SGNP, and not a Flora, since a Flora needs diagnostic keys. One can also treat this work as an inventory or catalogue of wild plants of SGNP. The meticulously drawn illustrations are of great help in identification. Taxonomic identification of the unidentified plants included can be a good exercise for those who like the subject.

This book is the result of the author's painstaking efforts of learning and reproducing. I am sure it will prove a great help to students, teachers, and layman as a guide.

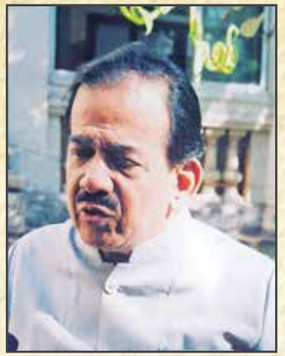
TERNATA – A Layman's Appreciation of Wild Flora of Sanjay Gandhi National Park (Mumbai)

by Oscar Fernandes

Published by the Author,
Printed by Dattsons,
J. Nehru Marg, Sadar,
Nagpur 440001, 2019

Pages 388, Price Rs 4,200/-

SHRADDHANJALI



Shri Nandakumar N. Naik

10th October, 1942 – 13th November, 2018

"Destiny will not listen nor change its path, even at Brahmadeva's request;
We all are commoners, who will listen to our request?"

"Our dearest Nandudada, your unexpected death has taken us to the sea of sorrow from where we have not yet come to the shore. We still do not believe that you are not with us. Till the last moment we hoped that you would fight with destiny and win the war of life."

Shri Nandkumar N. Naik was born iconic like all great leaders. His disciplined personality determined that he would never be the one to waste time in meaningless parties and picnics. He used his vacations to join classes for the next academic year, and he excelled in all the examinations in which he appeared. A host of his academic degrees included M.A. in Economics and Political Science, LLM in Commerce and Business Laws, Trade Marks and Copyrights, Diploma in Business Management through Davar's College, Mumbai, a Diploma in Journalism, Advertizing, and Printing through Bhavan's College, Mumbai, and Sanskrit Bhasha through Lokmanya Tilak College, Pune.

In the 108 years history of Bombay University, he was the first Law Student to be elected on the Senate in the year 1970, and thereafter he was elected as a Member of the Senate for the next thirty years. He was looking after the Finance Department of Bombay University, including the yearly budgets. He was a founder member of Bombay Students Welfare Centre and Vice President, Tree Committee of "Clean City-Bombay", Area – Mahim creek to Eastern Express Highway. As Chairman of the Bombay Youth Centre under Bombay University – Youth Exchange Programme covering Punjab, Maharashtra, he excelled in his contributions. He was also Vice President of the National Society of the Friends of the Trees, Hon. Jt Secretary, UNESCO Club Maharashtra, and Vice Chairman, World University Services – Bombay Committee. As Managing Director, Maharashtra Youth Centre, K.C. College student representative on Board of Welfare through Bombay University, he was intimately connected with University student affairs.

Shri Nandkumar Naik was also associated with several social, cultural, and educational institutions. He used to regularly donate blood since the age of 20. With his selfless nature, he provided financial aid to underprivileged students and financial aid to cancer patients at Tata Memorial Hospital. He contributed generously to ISKCON for their Annapatra programme, and at Seva Sadan Girls School he used to provide yearly fees, books, and uniforms. He also contributed to PETA – an organization for animal welfare.

Shri Naik was duly rewarded with the Shiva Chhatrapati Award by Government of Maharashtra for his thesis on Sports and Tournaments. The Friends of the Trees also presented him the Friends of Trees Award.

FOT organized a condolence meeting as a mark of respect for Shri Nandkumar Naik, to showcase his outstanding personality and his hard work, his passion for helping and educating the backward, downtrodden, and economically disadvantaged. The meeting was attended by Dr Pheroza Godrej, President Emeritus, Dr Ashok Kothari, President, numerous members of the Society and friends, family and admirers of Shri Naik.

ASHA DAMLE

Contributors

Dr Pradeep K. Srivastava is a former Deputy Director (Senior Principal Scientist) in the Medicinal and Process Chemistry Division of CSIR-Central Drug Research Institute, Lucknow, India, with more than 36 years R&D experience in synthetic and natural product chemistry. He is an environmental expert of international standing, has travelled and delivered more than 1,250 invited lectures in all five continents of the world. He is a winner of numerous national and international awards and has been involved in the promotion of popular science worldwide.

Dr Milind Madhav Sardesai is Professor at the Department of Botany, Savitribai Phule Pune University. He has worked at Shivaji University, Kolhapur, Abasaheb Garware College, Pune, and Dr Babasaheb Ambedkar Marathwada University, Aurangabad. He has specialized in the taxonomy of Angiosperms, and is engaged in plant exploration in Maharashtra, especially Western Ghats. He has guided four PhDs, and has numerous ongoing research projects. He has published three books, 56 papers, and numerous articles. He was awarded Dr. V.V. Sivarajan Gold Medal for Plant Systematics (2017) by Indian Association for Angiosperm Taxonomy. As Honorary Member, Plant Expert Committee, State Biodiversity Board, Maharashtra and Honorary Member, IUCN SSC (Plant Specialist Group) for Indian Subcontinent, he is involved in conservation policy issues. He has described 17 new species.

Mr Murari Ratnam studied MSc with Organic Chemistry from Delhi University in 1975, and MTech (Chemistry) in from IIT Delhi with distinction in 1977. He joined Central Soil and Materials Research Station, Ministry of Water Resources, New Delhi as Research Officer and retired as Director of CSMRS in 2016. He has specialized in the use of various binding materials in dams, using cement, fly ash, and other materials, promotion of waste materials in construction, and the role of polymeric materials in construction, among others. He has published more than 100 papers in such fields, related to issues in building materials and construction. Dr Ratnam contributed in the preparation of two codes for the Bureau of Indian Standards.

Mr Ajit Sonakia IFS retired as Principal Chief Conservator of Forests, Madhya Pradesh at Bhopal. Starting in 1981 in Raipur (presently in Chhattisgarh State), he worked in various capacities, as Field Director Kanha National Park (NP), Bandhavgarh NP, Sanjay NP, Madhav NP, Panna NP, and Wildlife Headquarters in Madhya Pradesh Forest Department. His special interest in Global Warming and Climate Change inspires him to work towards creating awareness amongst students, administrators, policy makers, and common people about the causes and effects of Global Warming, and possible remedial measures. His book "Defying the Inevitable" was recently published on this subject.

Mr V.M. Meher-Homji has had an illustrious career in environment related research. His publications cover diverse subjects ranging from the phytogeography of South Indian hill stations to the repercussions of deforestation on rainfall precipitation in Karnataka. His book "Bioclimatology and Plant Geography of Peninsular India" is a benchmark in the field, and he has numerous scientific papers to his credit. He has also contributed his knowledge in many popular scientific articles.

Dr C.S. Lattoo MSc, PhD (Botany), University of Mumbai, remains associated with Institute of Science, Mumbai where he retired from the Botany Department. He has more than 45 years experience of collection and identification of plants in the field, which he shares with graduate, postgraduate, and research students of the Institute and other colleges in Mumbai. He has been a Visiting Faculty in the Department of Extra Mural Studies, University of Mumbai, for 20 years, and at Rachna Sansad for Masters in Environmental Architecture for 15 years. He has conducted nature trails for students and others, and is a Life Member of BNHS, FOT, and Society for Clean Environment.

Mr Somnath Pal is a hobbyist, collector, hybridizer, and small seller of lotuses and water lilies. He became interested in these flowers at the age of 16, and developed his hobby into a small scale entrepreneurship. He now holds more than 120 varieties of water lilies and over 50 varieties of lotuses in the Liliaceae collection at his farm. He has developed and registered six new cultivars and is in the process of registering more.

Dr Pankaj Kumar Sahu Assistant Professor, Department of Botany, Guru Ghasidas Vishwavidyalaya Bilaspur, obtained his postgraduation and doctoral degrees in Botany from Dr Hari Singh Gour University, Sagar, Madhya Pradesh. He has published more than 30 research papers and participated in many national and international conferences and workshops. Dr Sahu has specialized in taxonomy and applies it to plant conservation.

Ms Shobha Ramana Pakala is an educationist, avid gardener, and life skills trainer. She is a trained career counsellor and has conducted workshops in various schools in Mumbai on adolescent problems, tobacco addiction, and memory management. She conducts gardening classes for children and adults. She is widely travelled, with a passion for history and cooking.

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